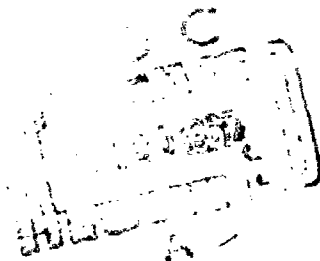


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Civil Defense Research  
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225 N. Milledge Avenue  
Athens, Georgia

31 December, 1966

FINAL REPORT

1966

Shelter Occupancy Studies  
at the University of Georgia

OCD Contract No. OCD-PS-66-25  
OCD Work Unit 1521A

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### Abstract

In the period 1962-66, the Civil Defense Research Staff at the University of Georgia has conducted ten simulated fallout shelter occupancy studies. These tests involved healthy men, women, and children, nine months through seventy-three years of age, in groups of thirty to five hundred persons, confined for periods of two days to two weeks under rather austere shelter conditions.

Detailed findings of these occupancy tests have been presented in previous annual reports. The present report contains findings of the 1966 occupancy tests, as well as a synthesis of all studies to date, and the implications for research in the National Shelter Program. A research prototype Community Shelter Handbook for Untrained Management is included.

## Chapter 1 - The Research Mission

### I. Introduction

The University of Georgia has conducted ten community shelter occupancy studies during the period 1962-1966 and produced three research films. The tests indicate that the presently stocked OCD supplies are adequate for the sustenance of men, women, and children, aged 1-70 years. A further finding is that community shelter occupants are capable of managing a shelter themselves, without the benefit of trained management, having but a handbook as an organizational guide. This Handbook has been tested with several three hundred-person groups and has been recommended to OCD as a possible stocking item. Basically, the Handbook contains (1) entry phase instructions for establishing initial vital operations, (2) a permanent staff organizational structure for maintaining such operations over an indefinite period of time, (3) procedures for helping occupants adjust to shelter life, and (4) training material for preparing shelterees for post-attack emergence.

In addition to preparation of a research prototype shelter handbook, Civil Defense Research at the University of Georgia has conducted a continuing evaluation of OCD stocked supplies of food, water, sanitation kits, commode chemicals, and medical kits.

Lastly, material has been gathered for the formulation of a crash program of shelter management training. It is conceivable that such a course, involving but a few training hours, could be implemented on a nation-wide basis in event of an impending nuclear emergency. It should be noted, however, that the Handbook has been structured on the severest assumption of all, that of a totally unprepared civilian population being suddenly thrust into the community fallout shelter situation.



## II. Past Research

A summary of Experimental Studies I-X is presented in Table 1. Experimental Studies IX and X, conducted in 1966, are described in this report. ES IX, a weekend test conducted 29 April-1 May, 1966, was a 160-person study, the primary purpose of which was to investigate the problem of reduced space allotment. Occupants were allowed 6-7 sq. ft. of space per person, including storage. Consequent effects on management were studied, as well as several space utilization plans. ES X, the largest occupancy test conducted to date, involved 500 men, women, and children, aged 9 months-73 years. The weekend study evaluated primary variables of management problems, the Shelter Handbook, and reduced space allotment.

The research prototype CDR Shelter Handbook has undergone many revisions since its inception in Experimental Study V. Evolved editions have been periodically submitted to OCD. The seventh edition is printed as Volume Two of this report.



Experimental Study <sup>a</sup>	Date	Shelterees				Shelter Environment				
		N	Sex	Age	Defections	Net Space/Person sq. ft.	cu. ft.	Temp.	Hum.	Ver cfw
ES I	14-18 Dec. 1962	30	Men, women, children	15-50	8	8	52	opt.	opt.	15 (20% fr
ES II	16 Feb.- 1 Mar. 1963	30	Men, women, children	9-67	5	8	52	opt.	opt.	Day: 40 (; Night: 15 :
ES III	27 Apr.-10 May, 1963	30	Men, women, children	7-66	2	8	52	opt.	opt.	Day: 40 (; Night: 15 :
ES IV	20-27 July 1963	30	Children, two adults	7-12	12	6	39	opt.	opt.	Day: 40 (; Night: 15 :
ES V	8-21 Feb. 1964	30	Men, women, children	7-70	8	8	52	opt.	opt.	Day: 40 (; Night: 15 :
ES VI	31 July- 2 August 1964	300	Men, women, children	3-66	0	10 <sup>c</sup>	—	opt.	opt.	MRD Ventil.
ES VII	19-26 June 1965	307	Men, women, children	2-67	62	10 <sup>c</sup>	—	warm	mod.	Natural plu
ES VIII	10-12 Sept. 1965	321	Men, women, children	1-67	8	10 <sup>c</sup>	—	warm	mod.	Natural plu
ES IX	29 April- 1 May 1966	160	Men, women, children	1-65	22	6-7 <sup>c</sup>	—	warm	mod.	Natural plu
ES X	22-24 July 1966	504	Men, women, children	9 (mos.)- 73	87	8 <sup>c</sup>	—	warm	mod.	Window far

<sup>a</sup>ES I - IV were presented in the 1962-63 Final Report.

ES V and ES VI were presented in the 1964 Final Report.

ES VII and ES VIII were presented in the 1965 Final Report.

<sup>b</sup>Shelterees requested to consume as few rations as possible.

<sup>c</sup>Including storage.

<sup>d</sup>OCD stocked supply consumption. Amount of food and water brought in by shelterees not inventoried.

Not brought by all shelterees.

<sup>e</sup>Brought by very few shelterees.

<sup>f</sup>One cot provided in CDR supplementary medical supplies.

Shelter Environment				Shelter Supplies			
Person No. Ft.	Temp.	Hum.	Ventilation cfm/person	Water qt./person/day Consumed	Food cal./person/day Consumed	Sanitation	Bun
52	opt.	opt.	15 (20% fresh air)	1.3 <sup>b</sup>	315 cal. <sup>b</sup> Bulgur wafer	Chemical toilet	No
52	opt.	opt.	Day: 40 (20% fresh air) Night: 15 (20% fresh air)	1.4 <sup>b</sup>	787 cal. <sup>b</sup> Bulgur wafer	Chemical toilet	No
52	opt.	opt.	Day: 40 (20% fresh air) Night: 15 (20% fresh air)	1.0 <sup>b</sup>	814 cal. <sup>b</sup> Nabisco biscuit	Chemical toilet	No
39	opt.	opt.	Day: 40 (20% fresh air) Night: 15 (20% fresh air)	1.0	552 cal. Nebraska cracker + 296 cal. carbo suppl. = 848 cal.	Chemical toilet	No
52	opt.	opt.	Day: 40 (20% fresh air) Night: 15 (20% fresh air)	1.0	808 cal. (Bulgur wafer, Nabisco biscuit, Nebraska cracker, carbohydrate supplement)	Chemical toilet	No
—	opt.	opt.	MRD Ventilation Tests	1.0	306 cal. Nebraska cracker + 208 cal. carbo suppl. = 514 cal.	Chemical toilet	No
—	warm	mod.	Natural plus window fans	1.2 <sup>d</sup>	776 cal. <sup>d</sup> Cracker and carbohydrate supplement	Chemical toilet	Cots, sl an
—	warm	mod.	Natural plus window fans	.8 <sup>d</sup>	655 cal. <sup>d</sup> Cracker and carbohydrate supplement	Chemical toilet	Cots, sl an
—	warm	mod.	Natural plus window fans	2.7 <sup>d</sup>	560 cal. <sup>d</sup> Cracker and carbohydrate supplement	Chemical toilet	Slee an
—	warm	mod.	Window fans and PVK	1.4 <sup>d</sup>	568 cal. <sup>d</sup> Cracker and carbohydrate supplement	Chemical toilet	Slee an

entoried.



**TABLE 1**  
**EXPERIMENTAL SHELTER OCCUPANCY VARIABLES**

Food cal./person/day Consumed	Shelter Supplies						
	Sanitation	Bunks	Blankets	Bath Water	Coffee	Cig.	Recreational Supplies
cal. <sup>b</sup> Bulgur wafer	Chemical toilet	No	No	No	No	No	No
cal. <sup>b</sup> Bulgur wafer	Chemical toilet	No	No	No	No	1 pk.	No
cal. <sup>b</sup> Nabisco biscuit	Chemical toilet	No	No	No	No	1 pk.	No
cal. Nebraska cracker + cal. carbo suppl. = 848 cal.	Chemical toilet	No	No	No	No	1 pk. adults	paper and pencils
cal. (Bulgur wafer, Nabisco cracker, Nebraska cracker, hydrate supplement)	Chemical toilet	No	No	No	No	1 pk.	No
cal. Nebraska cracker + cal. carbo suppl. = 514 cal.	Chemical toilet	No	No	No	No	1 pk.	No
cal. <sup>d</sup> Cracker and hydrate supplement	Chemical toilet	Cots, sleep mattresses, and blankets <sup>e</sup>		No	No <sup>f</sup>	Yes	Yes <sup>g</sup>
cal. <sup>d</sup> Cracker and hydrate supplement	Chemical toilet	Cots, sleep mattresses, and blankets <sup>e</sup>		No	No <sup>f</sup>	Yes	Yes <sup>g</sup>
cal. <sup>d</sup> Cracker and hydrate supplement	Chemical toilet	Sleep mattresses and blankets <sup>e</sup>		No	No <sup>f</sup>	Yes	Yes <sup>g</sup>
cal. <sup>d</sup> Cracker and hydrate supplement	Chemical toilet	Sleep mattresses and blankets <sup>e</sup>		No	No <sup>f</sup>	Yes	Yes <sup>g</sup>

## Chapter 2 - Experimental Study IX

### Part One - Experimental Design

#### I. Purpose

The primary purposes of ES IX (implemented 29 April-1 May, 1966) were (1) to investigate the effects of reduced space allotment on shelter management and shelter occupants, and (2) to evaluate various plans for efficient space utilization.

#### II. Space Utilization Plans

The following plans were to be experimentally programmed into the shelter routine:

- A. Storage of all possible items outside of the shelter, to include (a) shelteree personal possessions, (b) OCD stocks not needed for the first three days, and (c) used commodes and trash containers.
- B. Use of one layer surface of spread out OCD food boxes as living space.
- C. Use of shift-sleeping, was to involve two different sleeping shifts for half the shelter population at a time--9:00 P.M. to 3:00 A.M. and 3:00 A.M. to 9:00 A.M.

#### III. Shelteree Characteristics

- A. Number: 160 (147 shelterees, was to include 2 medics, and 13 inside observers during waking hours)
- B. Age: 1-70 years
- C. Sex: Approximately evenly divided
- D. Instructions prior to arrival: (a) conditions will be crowded, (b) bring only those supplies considered necessary for survival in a real attack, (c) OCD stocks provided, (d) no pets allowed, (e) no cameras allowed, (f) no note-taking permitted during the study, (g) study will be integrated, and (h) time to report for test.

#### IV. Pre-Shelter Processing

Shelterees were to report to the Coliseum parking lot and be transported to the shelter facility (Costa Building) by bus. Pre-processing was to take place on the first floor of the Costa Building, from 4-6 P.M. on Friday, 29 April.

After processing, and just prior to shelter entrance, shelterees were to be briefly addressed by the Project Director. They were to be told that they would manage the shelter themselves, with the aid of a handbook stocked with shelter supplies.

#### V. Shelter Management

- A. Staff: Shelterees were to manage the shelter themselves, using the Handbook as a guide. The only exception would be CDR experimental programming of space utilization plans.
- B. Entry phase: Section formation was to take place after all shelterees had entered.
- C. Space Utilization: Plans for efficient use of space were to be experimentally programmed.
- D. Handbook: A revised entry phase task assignment procedure was to be tested. The shelter manager triumvirate concept was to be continued.
- E. EOC: An EOC format was to be programmed.

#### VI. Shelter Environment

- A. Shelter: Second floor room in the Costa Building
- B. Space: Approximately 6 sq. ft./person, including storage, during daylight hours, and approximately 6.5 sq. ft./person, including storage, during night hours (after 12 CDR observers leave--the 2 medics and 1 inside observer stay).
- C. Ventilation: Natural ventilation, and possibly window fans. (Heat stress was not to be a variable.)
- D. Supplies: (a) Handbook, (b) shelteree personal possessions, (c) OCD stocks of food, water, three Sanitation Kit IV, and one Radeff Kit, (d) Medical Kit C with supplements based on past CDR recommendations, and (e) one broom and one mop.

## Part Two - Results

### I. Space Utilization Plans

During the temporary phase of confinement, shelterees voluntarily implemented Handbook instructions suggesting exclusion from the shelter of food boxes and water drums not needed for the first three days of shelter life. However, the suggestion pertaining to food boxes being spread out in one layer in order to provide additional living space was ignored.

Another space plan utilized by the shelterees involved the exclusion of used commodes and trash containers as they became full. At the conclusion of the temporary phase, the Civil Defense Research staff instructed the permanent Shelter Manager to elicit the shelterees' cooperation in excluding all bulky personal possessions. Items excluded as a result of this request included suitcases, cardboard boxes, and folding cots. However, some shelterees objected to enforcement of this procedure by management and to inequitable enforcement.

A shift-sleeping plan was implemented Friday evening. One-half of the shelterees slept in two-thirds of the shelter area, providing 8.8 sq. ft./person, while the other half of the population were allotted the remaining one-third of the shelter, permitting 4.4 sq. ft./person. The first sleep shift (10 P.M.-4 A.M.) included women, girls, and children under eleven years of age, while the second sleep shift (4 A.M.-10 A.M.) involved men, boys, and again children under the age of eleven. However, the actual shift time periods resulted in approximately five hours for women, and two and one-half hours for men. Furthermore, the women were less quiet during the second shift and disturbed the men's rest.



On Saturday morning two pieces of 2' x 8' lumber and one unhinged door were given to the shelterees to use for makeshift

space utilization. These boards were placed on food boxes permitting effective dual use of the space storage and living surface.

The Saturday afternoon rest period tested still another space plan which required one-third of the shelterees to stand, one-third to sit, and one-third to lie down; the three positions were alternated on a twenty-minute basis for the one-hour period. Later in the afternoon, all shelterees reclined for a brief period, with resulting space allotment approximating 6.4 sq. ft./person.

The Saturday evening sleep arrangement allowed the sexually-segregated sleeping of all shelterees simultaneously. Families remained together, with single men and single women adjacent to each other. Because of intervening defections, space for Saturday night increased to 7.1 sq. ft./person.

Later evaluation has shown that of the 89 persons responding, 84 preferred the Saturday night arrangement, 1 preferred the Friday night sleeping plan, and 4 stated they would have preferred the Saturday afternoon plan as a sleep arrangement.

Still photos and 8 mm. motion film were taken of sleep arrangement plans and presented to the Office of Civil Defense at a Pentagon briefing.

On the basis of test data, it was concluded that (1) shift-sleeping is not advisable for a single-room shelter, (2) space should not be less than 7.0 sq. ft./person for the conditions tested, (3) exclusion of personal possessions can induce a morale problem if shelterees object, and if once enforced by management, all shelterees are not equally compelled to comply.

## II. Shelteree Characteristics

Shelteree characteristics are presented in Tables 2 and 3. The median age of twenty-two years is the highest for the larger-group CDR occupancy tests to date.

Thirteen CDR staff members served in the capacities of either inside observer or shadow staff.

## III. Pre-Shelter Processing

### A. Medical Coverage on Day of Entry

Upon arrival on the day of shelter entry, each shelteree was required to complete a medical questionnaire. Shelterees who listed a condition which could pose a threat to the health of other

Table 2  
Shelteree Characteristics  
(ES IX)

Item	U.S. Census (1960)	ES IX
Number of Shelterees		160 (147 shelterees, 13 CDR Staff)
Age Range		1-65
Average Age	29.5 years (median)	23.9 years (mean) 22.0 years (median)
Average Education <sup>a</sup>	10.6 years (median)	11.6 years (mean) 12.0 years (median)
Sex	49.3% males 50.7% females	49.7% males 50.3% females
Race	88.6% white 10.5% Negro 00.9% others	81.0% white 19.0% Negro

<sup>a</sup>Computed for shelterees 25 years of age and over.

Table 3  
Shelteree Occupational Background  
(ES IX)

Occupational Level	Number	Percent
Professional and Managerial	12	8.2
Clerical and Sales	5	3.4
Service	10	6.8
Agricultural, Fishery, and Forestry	4	2.7
Skilled	12	8.2
Semi-skilled	0	0.0
Unskilled	1	.6
Housewife	19	12.9
Student	57	38.8
Pre-school	20	13.6
Unemployed and Retired	2	1.4
Information not available	5	3.4

shelterees, or which might be complicated by the shelter stay were referred to a physician for further evaluation. These referrals were designated as "non-routine." All shelterees 50 years of age or older were referred to a physician for a checkup. These referrals were designated as "routine." There were eight routine referrals and thirty-one non-routine referrals. Colds accounted for most referrals (12). (See Table 4.) Of the non-routine referrals males accounted for twenty-four while females accounted for only seven. The age group of 20 to 29 accounted for more non-routine referrals (11) than any other. Although there were a number of referrals in most age groups, no one was rejected for medical reasons on the day of entry.

#### B. Civil Defense and General Emergency Preparedness

Prior to shelter entry, 99 shelterees over 14 years of age completed a Civil Defense Information Questionnaire. Most persons were found to be unprepared for emergencies:

1. Slightly over 1% of the shelterees had home shelters.
2. About 10% of the shelterees had attended Civil Defense classes. The age and sex of these shelterees were fairly evenly divided.
3. Fifty-three percent of the shelterees, slightly more males than females, knew the locations of shelters.
4. About 10% of the shelterees had emergency supplies of food and water in the home.
5. About 39% of the shelterees had emergency supplies of medicine and first aid equipment in the home. The 20-29 year old age group accounted for over 50% of the positive answers to the question concerning these supplies. Perhaps the reason for this unusual fact is that this age group is likely to be made up of parents of young children and may be more aware of first aid needs.

#### C. Leadership Prediction

On the Pre-Shelter Questionnaire, one question differentiated both temporary and permanent staff members from their corresponding age groups in the non-staff shelteree population: "Are you a high school graduate?" Other questions also discriminated. (See Tables 5 and 6.)

With regard to the Minnesota Multiphasic Personality Inventory (MMPI) Leadership Sub Scale given to 96 shelterees over 14 years of age prior to shelter entry, both staff groups scored significantly higher than the remaining population, but did not score significantly



Table 4  
Reason for Medical Referral on Day of Entry  
(ES IX)

Complaint	Age, Sex, and Number																Total	
	0-9		10-19		20-29		30-39		40-49		50-59		60+					
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
	18	19	37	18	12	30	9	10	19	6	12	18	3	4	7	73	74	147
Routine	0	0	0	0	0	0	0	0	0	0	0	0	2	4	6	2	6	8
Non-routine																		
Cold	2	1	3	4	0	4	3	1	4	0	0	0	1	1	0	0	0	0
Virus or flu*	3	0	3	1	0	1	2	0	2	0	0	0	0	0	1	0	1	0
On medication	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0
Asthma	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0
Stomachache or gastroenteritis	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0
Sore throat	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hay fever	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	1	1	2	1	0	1	0	0	0	1	1	0	0	0	0

\*These illnesses were reported by the prospective shelterees to have occurred sometime within the month preceding the study.

Table 5  
Comparison of Permanent Staff with Other Shelteree  
Responses on Certain Pre-Processing Questions  
(ES IX)

Question	N	Group	Response		Chi-Square	p
			Yes	No		
Are you a high school graduate?	18 63	Permanent Staff Other Shelterees*	16 37	2 26	7.24	.01
In your job do you supervise anybody?	17 76	Permanent Staff Other Shelterees*	11 10	6 66	21.16	.001
Do you feel self-confident and at ease when leading a group of people?	17 80	Permanent Staff Other Shelterees*	14 38	3 42	6.88	.01

\*Corresponding age groups.

Table 6  
Comparison of Temporary Staff with Other Shelteree  
Responses on Certain Pre-Processing Questions  
(ES IX)

Question	N	Group	Response		Chi-Square	P
			Yes	No		
Are you a high school graduate?	11 69	Temporary Staff Other Shelterees <sup>a</sup>	10 42	1 27	1.1 <sup>b</sup>	—
Have you held an office in any club or group within the last year?	11 87	Temporary Staff Other Shelterees <sup>a</sup>	8 32	3 55	5.22	.025

<sup>a</sup>Corresponding age groups.

<sup>b</sup>For theoretical reasons, the Chi-Square test cannot be applied. However, the ratios are obviously different.

different from each other. Of the temporary staff, 45.5% fell in the upper quarter of the total test score distribution, and of the permanent staff, 50.0% fell in the upper quarter of all test scores.

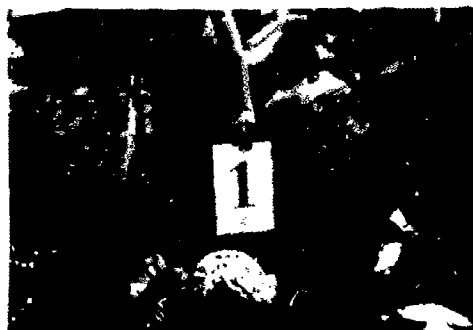
#### IV. Shelter Management Organization

##### A. Temporary Phase

In terms of amount of tasks accomplished, the triumvirate temporary manager system worked well in ES IX. The fact that all three of the temporary managers were acquainted probably facilitated their performance, but part of the rationale for having three managers is the moral support offered. All three of the temporary managers have had four years of college, and all scored well above average on the MMPI Leadership Sub-Scale.

The leaflet distribution method in ES IX worked well--all leaflets were handed out within eight minutes of shelter entry at 6:18 P.M. The Handbook was first opened three minutes after entry. Temporary Shelter Manager 1 asked for eight people who could read to come forward, and eight persons volunteered, which probably contributed much to the successful implementation of the temporary phase.

In spite of mistakes made during operations, the temporary staff structure was adequate. The eleven persons on the staff performed most of their instructions within two hours.



Information Cards, used to select the permanent staff, were distributed, filled out, and returned within forty-five minutes of shelter entry time. Although instructions on the Information Cards were not clear to some shelterees, they were correctly followed by most of the temporary and permanent staff personnel.

The method of selection of the permanent staff was successful, but needs revision to shorten the time involved. The first staff

member to be selected was the doctor (7:20 P.M.); other selections were made in the recommended order, and all selections were completed by 8:04 P.M. (one hour and forty-six minutes after entry).

The shadow staff observations during the temporary phase provided much useful information which could not otherwise have been obtained. The use of dictating recorders both inside and outside the shelter provided one of the best sources of information.

#### B. Permanent Phase

The permanent staff structure was adequate, but the individual instructions need improvement. Individual staff initiative and leadership ability contributed strongly to the success of the permanent phase.

#### C. Staff Characteristics

Temporary and permanent staff characteristics are presented in Tables 7 and 8. When compared to other shelterees 20 years of age and over, the mean staff age was significantly lower (combined staff mean age 29.7 yrs.; non-staff mean age 37.8;  $P < .005$ ). Education-wise, the staff was superior (staff mean education 14.1; non-staff mean education 10.9;  $P < .005$ ). There were no significant differences between staff and non-staff groups on the number of family members or the number of children in the shelter.

#### D. Shelter and Shadow Staff Handbook Evaluation

Shelter staff and shadow staff evaluations of the Handbook and management structure are presented in Tables 9 and 10.

### V. In-Shelter Program

#### A. Chronology of Events

##### Friday Afternoon, 29 April, 1966--Temporary Phase

The first shelteree entered the shelter at 6:18 P.M. on Friday, April 29, 1966. The Handbook was found three minutes later, and temporary phase proceedings began. By 6:26 P.M., all instruction leaflets were handed out, and shelterees read their instructions. The command post was established and marked at 6:24 P.M. Information Cards were then passed out to obtain needed data for the selection of the permanent staff.

Temporary Shelter Manager 2 delivered his prepared speech to an attentive audience at 6:35 P.M. Sanitation, medical, and radiological kits were inspected by the temporary staff. At

Table 7

Temporary Shelter Staff Characteristics  
(ES IX)

Position	Age <sup>a</sup> Sex	Occupational Background	Education <sup>b</sup> (Years)	Marital Status	Number of Children in Shelter	Number of Family Members in Shelter
Temporary Shelter Manager 1	21 M	Student	16	M	0	0
Temporary Shelter Manager 2	22 M	Student	15	M	0	1
Temporary Shelter Manager 3	24 M	Student	16	M	0	1
Temporary Radiological Officer 1	49 M	Teacher	18	M	3	4
Temporary Radiological Officer 2	26 M	Naval Officer	16	M	0	0
Temporary Security Officer	37 M	Production control supervisor	14	M	1	1
Temporary Water Supply Officer	31 M	Student	16	M	1	1
Temporary Food Supply Officer	20 M	USAF (E.M.)	12	M	0	1
Temporary Medical Officer	21 M	Student	15	S	0	0
Temporary Communications Officer	31 M	Filter carrier	12	M	2	3
Temporary Sanitation Officer	30 M	Pressman	9	M	2	3

<sup>a</sup> Mean age--28.4; age range--20-49; median age--26.<sup>b</sup> Mean education--14.5; educational range--9-18; median education--15.

Table 8  
Permanent Shelter Staff Characteristics  
(BS IX)

Position	Age	Sex	Occupational Background	Education <sup>b</sup> (Years)	Marital Status	Number of Children in Shelter	Number of Family Members in Shelter
Shelter Manager	37	M	Production control supervisor	14	M	1	1
Assistant Shelter Manager	49	M	Teacher	18	M	3	4
Director of Activities	23	F	Teacher	15	M	0	1
Director of Training	24	M	Student	16	M	0	1
Director of Operations	31	M	Student	16	M	1	1
Director of Supply and Maintenance (defected)	30	M	Pressman	9	M	2	3
Director of Supply and Maintenance (replacement)	26	M	Naval Officer	16	M	0	0
Director of Radiological Monitoring and Communications (defected)	24	M	Mechanic	12	M	0	1
Director of Radiological Monitoring and Communications (replacement)	27	M	Dock foreman	12	M	0	1
Head of the Fire Control Team	42	M	USDA research (engineer)	17	M	1	1
Administrative Clerk	22	F	Secretary	12	M	0	1
Head of the Shelter Medical Staff	--	--	Licensed physician (CDR)	--	--	--	--
Section Leader	21	M	Student	16	M	0	0
Section Leader	22	M	Student	15	M	0	1
Section Leader	20	M	USAF (E.M.)	12	M	0	1
Section Leader	47	M	USA (E.M.)	12	M	2	3
Section Leader	29	M	Student	17	M	2	3
Section Leader	29	M	Foreman	10	M	4	5
Section Leader	46	M	Salesman	11	M	2	3

<sup>a</sup> Mean age--30.5; age range--20-49; median age--29.0.

<sup>b</sup> Mean education--13.9; educational range--9-18; median education--14.5. (The original permanent staff members were used in these calculations.)

Table 9

Shelter Staff Handbook Evaluation in the Temporary and Permanent Phases  
(ES IX)

Temporary Phase			Permanent Phase*		
Do you feel that your job would be important in case of a real attack emergency?					
<u>Yes</u> 11	<u>No</u> 0		<u>Yes</u> 16	<u>No</u> 1	
Did you have too much to do?					
<u>Yes</u> 3	<u>No</u> 8		<u>Yes</u> 0	<u>No</u> 17	
Were your instructions easy to read and understand?					
<u>Yes</u> 11	<u>No</u> 0		<u>Yes</u> 17	<u>No</u> 0	
Did your instructions fully describe your duties?					
<u>Yes</u> 10	<u>No</u> 1		<u>Yes</u> 16	<u>No</u> 1	
Did your staff (permanent or temporary) work well together?					
<u>Yes</u> 10	<u>No</u> 1		<u>Yes</u> 17	<u>No</u> 0	
Should your staff have been larger or smaller or was it adequate?					
<u>Larger</u> 1	<u>Smaller</u> 1	<u>Adequate</u> 9	<u>Larger</u> 0	<u>Smaller</u> 3	<u>Adequate</u> 14
Did the other shelterees respect and recognize your staff authority?					
<u>Yes</u> 11	<u>No</u> 0		<u>Yes</u> 17	<u>No</u> 0	
Did you like the manner in which you were selected to be a staff member?					
<u>Yes</u> 8	<u>No</u> 3		<u>Yes</u> 15	<u>No</u> 2	
Would you have volunteered to become a staff member had you not been selected?					
<u>Yes</u> 10	<u>No</u> 1		<u>Yes</u> 16	<u>No</u> 1	
Do you like the way your section of the Handbook was organized?					
<u>Yes</u> 9	<u>No</u> 0		<u>Yes</u> 17	<u>No</u> 0	
Under emergency conditions (war and bombing) would the instructions given you have been adequate?					
<u>Yes</u> 8	<u>No</u> 1		<u>Yes</u> 17	<u>No</u> 0	

\*There were 15 permanent staff positions; however, two members defected and were replaced, providing a total of 17 responses to each question.



Table 10

Shadow Staff Handbook Evaluation in the Temporary and Permanent Phases  
(ES IX)

Temporary Phase			Permanent Phase		
Do you feel that this position would be important in case of a real emergency?					
<u>Yes</u> 11	<u>No</u> 0		<u>Yes</u> 11	<u>No</u> 0	
Did the shelter staff member you were shadowing have too much to do?					
<u>Yes</u> 2	<u>No</u> 9		<u>Yes</u> 0	<u>No</u> 11	
Were the Handbook instructions for this position easy for you to read and understand?					
<u>Yes</u> 9	<u>No</u> 2		<u>Yes</u> 10	<u>No</u> 1	
Did the instructions for this position fully describe the duties required?					
<u>Yes</u> 9	<u>No</u> 2		<u>Yes</u> 8	<u>No</u> 3	
Did the shelter staff member you were shadowing work well with the other shelter staff members?					
<u>Yes</u> 10	<u>No</u> 1		<u>Yes</u> 10	<u>No</u> 1	
Should the shelter staff have been larger or smaller or was it adequate?					
<u>Larger</u> 0	<u>Smaller</u> 0	<u>Adequate</u> 11	<u>Larger</u> 0	<u>Smaller</u> 0	<u>Adequate</u> 11
Did the shelterees respect and recognize your shelter staff member's authority?					
<u>Yes</u> 11	<u>No</u> 0		<u>Yes</u> 11	<u>No</u> 0	
Do you like the manner in which the shelter staff member that you were shadowing was selected?					
<u>Yes</u> 9	<u>No</u> 2		<u>Yes</u> 10	<u>No</u> 1	
Do you think qualified shelterees would have volunteered to become staff members had they not been selected?					
<u>Yes</u> 11	<u>No</u> 0		<u>Yes</u> 10	<u>No</u> 1	
Do you like the way your section of the Handbook was organized?					
<u>Yes</u> 11	<u>No</u> 0		<u>Yes</u> 5	<u>No</u> 6	
Under emergency conditions would the instructions given for your staff position be adequate?					
<u>Yes</u> 9	<u>No</u> 2		<u>Yes</u> 8	<u>No</u> 3	

6:39 P.M., the radef kit was picked up, and both Radiological Monitors inspected it. A fire extinguisher was examined for use.



Temporary Shelter Manager 3 was the dominant figure in facilitating the elimination of non-essential supplies from the shelter. He announced to the shelterees at 6:43 P.M. that non-essential items must be removed from the shelter, and four minutes later he announced that the first chemical commode had been set up. The group response to the voluntary elimination of non-essential items was slow at first, but cooperation gradually increased until the shelter door was locked at 7:08 P.M. No more items were allowed to be taken from the shelter during the temporary phase. No Commode Monitor was present even though a line had formed at the entrance to the commode area by 6:50 P.M.



By 7:00 P.M., the shelterees had been in the shelter approximately forty-five minutes and were well on the way toward completion of the temporary phase. A sign designating the medical area was posted at 6:50 P.M. Temporary Shelter Manager 3 asked that shelterees not become permanently situated. At 7:17 P.M., Temporary Radiological Officer 1 placed his instrument on the communications table and left it there. The

duties required by the Handbook concerning radiological monitoring were left unfinished by the temporary staff.

At 7:20 P.M., the Information-Card sorters found the physician's card, and he was promptly designated shelter physician. At 7:21 P.M., Temporary Shelter Manager 3 stated that children were having difficulty in the rest room due to the height of the commode drums and suggested that they be accompanied by an adult. Temporary Shelter Managers 1 and 2 worked on the selection of the permanent staff. A temporary staff meeting was called, and the permanent staff was selected at approximately 7:40 P.M. The temporary staff meeting lasted approximately ten minutes. Permanent staff leaflets were distributed. By 8:02 P.M., those designated as the permanent staff were reading their leaflets, and three minutes later the permanent Shelter Manager read his prepared speech to the shelterees.

A permanent staff meeting was called at 8:10 P.M. Thus the time for completion of the temporary phase took approximately one hour and fifty minutes.

The temporary phase of Experimental Study IX progressed smoothly and effectively according to the format provided in the Handbook. The only assigned duties not carried out effectively by the temporary staff were in the areas of radiological and commode monitoring.

#### Friday Evening, 29 April, 1966--Permanent Phase

Permanent assignments were handed out, and at 8:05 P.M., as previously noted, the permanent Shelter Manager announced to the shelterees that he was the Shelter Manager. Between 8:05 P.M. and 8:15 P.M., the newly-formed Permanent Staff inspected facilities and had their first meeting. At 8:30 P.M., a permanent medical area was organized in a new location near the shelter entrance. Food and water were stored in the small room adjacent to the commode area and were distributed throughout the study by a Section Leader system.

The first food distribution occurred at 8:45 P.M. One empty food container was converted into a trash can. Water was distributed between 8:55 P.M. and 9:25 P.M. The siphon system seemed adequate. Again, the Shelter Manager announced the importance of cleanliness in the use of the commodes (8:50 P.M.). There still was no monitor.

People began to settle down for rest about 9:30 P.M. At 10:00 P.M., directions for shift sleeping were made over the public address system. With little confusion or comment, the

people moved to their assigned area. Whereas space conditions had previously appeared reasonably adequate, they now appeared quite crowded. At 10:30 P.M., diaries were filled out, and activity subsided for the night.

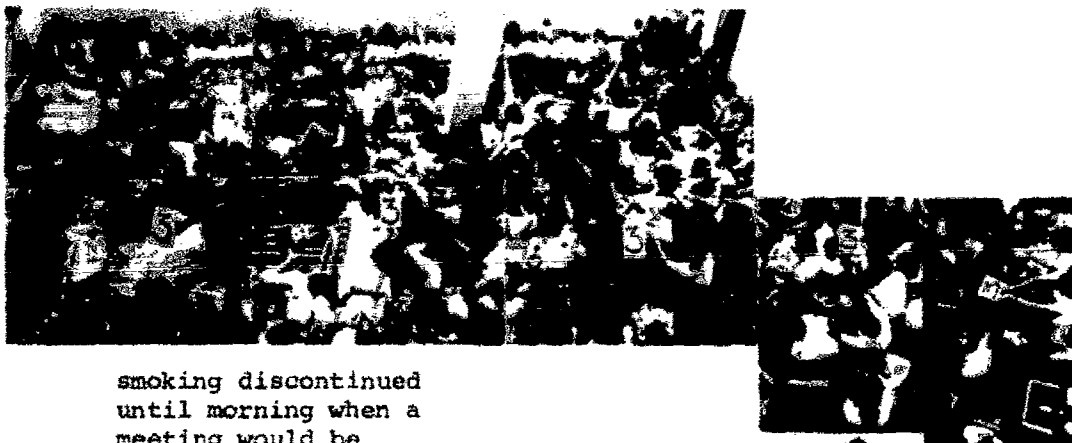
The sleeping plan as experimentally outlined was operating at 10:50 P.M. Most of the bedding equipment was located in the area opposite the shelter entrance, and the women and children slept there. Noise was kept at a minimum by the Shelter Manager, who was quite authoritative in manner. Movement was limited, because aisles were only made when necessary.

At 11:15 P.M., a woman was prompted by loneliness to seek out her husband in the men's section. She became the subject of some conversation and jesting, but her actions forced a decision by the Shelter Manager: the lady wanted to smoke, and the Shelter Manager decided that the people on the sleeping shift would not be allowed to smoke near bedding. The first medical complaint was registered at 12:30 A.M. by a woman who had been located right outside the commode area since her entrance into the shelter. She had been commenting on thirst and now desired an aspirin for a headache. Almost everyone was in some sort of a lying position by 1:30 A.M. There was no free space, and movement resulted in disturbing one's neighbor. It was observed that shelterees seemed to be waking up in groups without apparent cause and then resettling. Murmurs expressing body muscular aches were heard.

After the ventilation fans had been turned off for some thirty minutes, smoke became noticeable and was the object of comments and predictions from the physician about coughing. With the fans off, ventilation became uncomfortable. At 3:30 A.M., it was discovered that an unauthorized shelteree had called in to the experimental control room and requested that the fans be activated. His use of the equipment to make this contact was not challenged or hindered by shelter authorities.

At 3:58 A.M., the Assistant Shelter Manager instituted phase two of the shift-sleeping plan. Many of the children remained asleep as fathers and mothers exchanged places. The Shelter Manager showed little leadership at this point. He hesitated to make the women exchange locations with the men and to awake some women who remained asleep. It took a communication from the control room to prod the Shelter Manager in the necessity of moving the women for morale reasons. He was also reminded that all the men must be able to sleep.

The Shelter Manager, after several warnings from the medical personnel about the adverse effects of smoking, ordered



smoking discontinued until morning when a meeting would be called to make a decision on the matter. Female conversation increased the noise level as fathers and single men quieted the children and endeavored to get some sleep.

Saturday Morning, 30 April, 1966

The first defection, a 19-year-old male, occurred at 5:00 A.M. He complained of noise, heat, hunger, and inability to study for upcoming school examination. His departure appeared to boost morale. One shelteree commented, "Maybe we can stretch out now."

The nonexistent aisles were a source of humor to shelterees as they watched each other move about the shelter with difficulty. Smoke accumulated without any prohibitive word from the Shelter Manager, who was busy reading his section of the Handbook.

At 6:50 A.M. the lights were turned on, and the males were awakened from a two-hour-and-twenty-minute sleep to regroup their families in their particular sections. A general clean-up period followed. By 7:00 A.M., everyone was up. A family group indicated at 7:10 A.M. that they wished to leave the shelter. This was a group who had been located just outside the commode area since they entered the shelter. The youngest child in the shelter was in this family. The family left the shelter at 7:40 A.M., just prior to breakfast at 7:45 A.M.

The Shelter Manager announced that the physician had suggested that no meat sandwiches left from the previous day be consumed. After food and water had been distributed, various time-consuming activities, e.g., guitar playing and card games,



were undertaken. There were seven sections which were identified by the name of the Section Leader.

A staff meeting was conducted at 8:30 A.M. The group discussed such topics as smoking and sleeping arrangements for the coming night. The activities for the remainder of the time in the shelter were outlined by the Shelter Manager in a talk he gave to the entire group at 9:15 A.M. An order forbidding smoking between 11:00 P.M. and 7:00 A.M. was issued by the Shelter Manager.

Planks and a door to be used in any way the shelter staff desired were brought into the shelter without being examined for possible radioactive fallout. Three nurseries, based on age groups, were formed about 10:00 A.M., after which men and women shelterees attended a talk on "Nuclear Explosions" delivered by a female shelteree. A series of isometric exercises followed, involving about two-thirds of the shelter group. A food and water distribution period completed the morning's activities.

#### Saturday Afternoon, 30 April, 1966

There were five defections after lunch. In the early afternoon, two sleeping/resting plans were tested: (1) one-third of the shelterees standing, one-third sitting, and one-third lying down; (2) all shelterees lying down at one time. At 2:30 P.M. a five-minute lecture entitled "Life in the Shelter" was delivered by a male shelteree.

A 5:00 P.M. inspection of the male commode area revealed a leaking container; however, there seemed to be no odor. The female commode area, on the other hand, was quite dirty,

emanating a strong odor. An effort to improve sanitation was undertaken by installing a hand-washing facility consisting of a small supply of water in a water drum and soap. Two gallons of water were used by fifteen persons, following which a new supply of water was provided. The dirty water was dumped into a commode. Everyone used the same soap, and the water used for this purpose was never measured or recorded as being used.

Card tricks, singing groups ("The Fallout Five"), and joke tellers made up the entertainment for a forty-five-minute, shelter-wide talent show which began at 6:00 P.M.

Saturday Evening, 30 April, 1966

While the diaries were being distributed and completed, the Shelter Manager held a Section Leader meeting and discussed the sleeping arrangements for the evening. Two items mentioned as being needed were trash cans and ash trays. An 8:00 P.M. inspection revealed that the male and female commode areas were equally dirty and odorous, whereas up to this time, the male commode area had been kept in clean condition. The evening meal was served, with the carbohydrate supplement distributed by hand. No records were made of food and water distribution.

Preparations for the night's rest began with an 8:30 P.M. Shelter Manager announcement outlining the sleeping plan: single women against the wall opposite the shelter entrance, family groups in the center, and single men near the shelter entrance. The lights went out at 9:35 P.M., and a single transistor radio could be heard broadcasting a baseball game. The Director of Operations stationed himself in the small room containing shelter supplies and directed shelterees with his flashlight when they came to the commode area. He also made periodic security checks from his station.

Disregarding a previous announcement that there would be no smoking after lights out, a male shelteree made his way to the commode area and smoked a cigarette at 11:40 P.M. At 12:30 A.M. some older women in the center of the shelter requested that the fans be cut off. The request was relayed by the Communications Monitor to the control room, and the fans were cut off. Later requests for more or cooler air were ignored. The Communications Monitor was relieved at 12:50 A.M. His relief took radiological readings periodically throughout the night, but he failed to log the majority of them.

There were two noticeable factors during the night: (1) snoring became more pronounced as the night progressed, and (2) the crowded and uncomfortable shelter conditions promoted movement in sleep. At 2:00 A.M., a female shelteree



requested that the Communications Monitor ask that the ventilating fans be activated, in order that fresh air be brought into the shelter. The remainder of the night was uneventful, except for a male shelteree who complained of being too warm about 4:00 A.M. Requests to activate the fans during the night were not heeded, since the outside air was too cool to be brought into the shelter. Everyone appeared to be in a sound sleep at 5:00 A.M.

Sunday Morning, 1 May, 1966

Women were the first to begin awaking around 5:35 A.M. They also appeared to be more restless than the men, which may have been due to their location near windows and/or the restlessness of their children who did not sleep as well as the adults. Loud conversation from the women awoke the men who began to move about at 5:55 A.M.

Use of the commode, personal grooming, and the rearrangement of sleeping equipment initiated the morning activities. Very little conversation was heard during this period, and most persons sat quietly after waking. The Shelter Manager and other shelter staff members were still asleep at 6:15 A.M., and no attempt was made to arouse them. Requests were soon made that lights be turned on, but the Shelter Manager replied that it was not time to turn on the lights. The Communications Monitor requested that the control room personnel activate ventilating fans at a slow speed. Approximately one-half of the shelterees were up by 6:20 A.M., many of them aroused by the noise from the fans, the incoming cool air, and an increase in conversation. The Shelter Manager still made no attempt to organize the shelter or turn on the shelter lights. Generally speaking, single men and children appeared asleep, with older women and married couples awake. Although the lights were off



and the "no smoking" directive still held, several shelterees smoked. Conversation centered around food.

At 6:40 A.M., the Shelter Manager turned on the lights and delivered a pep talk in which he emphasized that the group was in the "home stretch" and going "down hill." Some disorganization was evident, because sections had been dissolved by the night's sleeping arrangements, and shelterees were dispersed without their section groups. However, the sections began to re-form at 7:05 A.M., in combination with a general cleanup of the shelter area. Various shelterees commented on having slept better than they did the previous night, and that they favored the second night's sleeping arrangements over those of the first night. A few persons engaged in brief self-directed exercise by taking brisk walks around the shelter area.

The commode areas had become quite littered and odorous by Sunday morning. Section Leaders were summoned at 7:50 A.M. to wash their hands and to distribute food. No attempt was made to conduct a group exercise period. Food and water distribution was completed at 8:25 A.M., and at 9:00 A.M. a staff meeting was held for revising the day's activities. The revised schedule was announced to the group just prior to the 9:30 A.M. religious service, which was conducted jointly by two ministers, one white and one Negro. The thirty-minute service included singing under the direction of the Director of Activities.

Diaries were filled out at 10:05 A.M., and at 10:55 A.M. a lecture on "Decontamination" was delivered. The shelterees were unable to hear adequately because of noise from the ventilating fans and restless children. The lecture ended at 11:07 A.M. Next on the program was a group exercise period, with emphasis on isometric-type movements. This period of activity seemed particularly enjoyable for the shelterees.

Following lunch, which was served from noon to 12:20 P.M., there was an informal rest period. Several shelterees appeared to sleep, while others rested and talked. About fifteen children took active part in one of the two nurseries, one for ages two through four and one for ages five to seven. A two-minute lecture on "Sanitation" was given at 2:00 P.M. by a female teacher. A third nursery composed of seven-year-olds was activated. At 2:25 P.M. an announcement concerning the Post-Shelter Questionnaire was made over the shelter public address system. The remainder of Sunday afternoon was marked by inactivity. Shelter exit occurred at 5:15 P.M.

## B. In-Shelter Activities

### 1. Emergency Operating Center

All communications with the Emergency Operating Center (EOC) were under the jurisdiction of the Director of Radiological Monitoring and Communications, who reports directly to the Shelter Manager.

During the study, the shelter was contacted periodically by a simulated Emergency Operating Center. Table 11 presents information requested by EOC from the shelter and the time required for such requests to be filled. The efficiency of the functioning of this phase of the study may be seen readily from an examination of the table.

### 2. Sleeping

On the first night of ES IX when the women and men were to sleep in six-hour shifts, respectively, the men actually had two hours and twenty minutes of sleep. It appeared that there was more room in the shelter when the men slept and the women sat than when the women slept. At 7:30 P.M. Saturday, the Shelter Manager held a meeting of his staff to discuss that evening's sleeping plan. The shelterees began to settle down at 8:25 P.M., following the plan of single women at one end of the shelter, family groups in the central portion, and single men in the area nearest the shelter entrance. Lights were turned out at 9:30 P.M. Saturday, and they were turned on again at 6:40 A.M. Sunday. The consensus was that the shelterees slept better Saturday night, even though there was less space per person because everyone slept at one time, than they did on the previous night when men and women slept in shifts.

### 3. Medical

According to the Handbook, the Head of the Shelter Medical Staff should be the most qualified person available. He selects his assistants from the information contained on the shelteree Information Cards, which he obtains from the Assistant Shelter Manager. The Head of the Shelter Medical Staff is directly responsible to the Director of Operations. The Handbook suggests that the medical area of the shelter be set up in a quiet part of the shelter away from the commode, periodically cleaned up, and guarded in order to prevent the theft of drugs.

Among the shelterees in ES IX were a physician and a registered nurse who remained incognito during the temporary phase of shelter operations, in order to ascertain the thoroughness with which the shelteree Information Cards were used in

Table 11

Emergency Operating Center Program  
(ES IX)

Message Content	Transmission Time	Reply Time
<u>4/29/66</u>		
Request for information on first detected increase in radiation; time shelter filled; sufficiency of supplies; status of sick and injured; additional communication equipment; ventilation; trained CD workers	6:15 P.M.	7:05 P.M.
Request for shelter radiation reading	8:40 P.M.	8:40 P.M.
Request for names and positions of shelter staff	9:30 P.M.	9:30 P.M.
<u>4/30/66</u>		
Request for shelter radiation reading	9:50 A.M.	9:50 A.M.
Instructions concerning area radiation	1:15 P.M.	No reply required
Information concerning location of additional supplies	2:15 P.M.	No reply required
Request for information on physical condition of shelter inhabitants	3:17 P.M.	3:40 P.M.
Request for information on adequacy of supplies	4:20 P.M.	4:25 P.M.
Reply to 4:25 P.M. report on supplies	5:30 P.M.	No reply required
Request for shelter radiation reading	8:10 P.M.	8:10 P.M.
<u>5/1/66</u>		
Request for shelter radiation reading	9:20 A.M.	9:30 A.M.
Request for inventory of shelter supplies	9:30 A.M.	10:25 A.M.
Suggestions for acquiring additional food supplies	10:00 A.M.	10:20 A.M.
Request for information on organization of decontamination teams	2:00 P.M.	2:15 P.M.

selecting appropriate persons for staff operations. According to routine procedure, a random shelteree was handed information for the Temporary Medical Officer, and he began to execute the duties of locating the medical kit, inspecting it, posting a sign designating the medical area, and preparing the area for its intended use. The physician and nurse were discovered on the basis of Information Card data, and they assumed their respective duties following the temporary phase.

More detailed information concerning medical aspects of ES IX is presented in another section of this report.

#### 4. Recreation

The Handbook suggests the scheduling of recreational activities in accordance with the needs of the shelter group, particularly during the early evening period. Such activities are the responsibility of the Director of Activities.

During ES IX, various individual or small-group recreational activities existed much of the time. These included such pastimes as guitar playing, card playing, drawing with crayons, and reading. At 6:00 P.M. Saturday, a forty-five-minute, shelter-wide talent show was held, consisting of card tricks, singing groups, and joke telling.



#### 5. Religious Activities

Religious activities are the responsibility of the Director of Activities. The Handbook specifically suggests that a non-denominational Sunday service be held, conducted by ministers or clergymen if possible.

A Sunday service was held during ES IX from 9:30 to 10:00 A.M. Two ministers, one white and one Negro, conducted the service. In addition, several shelterees brought Bibles into the shelter with them and were observed reading privately at various times.

## 6. Training

The Director of Training has three major areas of responsibility in implementing his duties: (1) training the shelter population concerning the nature of radioactive fallout; (2) seeing that the group has an opportunity to consider and work out some of the practical problems of shelter living; and (3) training shelterees for the time when they will exit the shelter either temporarily or permanently. As an aid in accomplishing training objectives, the Handbook contains written materials in the form of written lectures and supplementary information.

The first training lecture in ES IX was delivered by a female shelteree at approximately 10:30 A.M. Saturday. The topic was "Nuclear Explosions," and the session lasted eighteen minutes.

A second training lecture considered "Life in the Shelter." It was delivered at 2:30 P.M. Saturday and lasted five minutes.

A lecture on "Decontamination" was delivered at 10:55 A.M. Sunday. A fourth and final training session occurred at 2:00 P.M. Sunday, focusing on the topic of "Sanitation" and lasting two minutes.

## 7. Exercise

The Director of Activities is responsible for organizing formal exercise periods during confinement.

At 11:20 A.M. Saturday, approximately two-thirds of the shelter population participated in a series of isometric exercises. A similar session was held Sunday at 11:10 A.M., with the addition of body-bend type exercises.

## 8. Nursery

Another of the Director of Activity's duties is the provision of a nursery for periods of time during mornings and afternoons which will allow parents to be released from responsibility for their children and give opportunity for shelter activities which would otherwise be difficult to conduct, e.g., training sessions.

The first nursery period during ES IX was established at 10:00 A.M. Saturday. Almost the entire child population in the shelter participated in three age-graded nursery groups. Two nursery groups were formed on Sunday at 1:55 P.M., and a third nursery group was formed at 2:02 P.M. The age groups established by the nurseries consisted of children two through

four years of age, those five to seven years of age, and those seven years of age and over.

#### 9. Feeding

Food and water distribution and sanitation are the responsibility of the Director of Operations. He works closely with the Section Leaders to keep constant supervision over all phases of shelter feeding.

At 7:40 P.M. Friday, the Temporary Food Supply Officer (instead of the Director of Operations), utilizing food-ration tables provided in the Handbook, had arrived at appropriate amounts of stocked food supplies for the first shelter feeding. The first distribution of food began at 8:45 P.M., following the storage of food and water supplies in a small shelter room. Everyone had received his first issue of food and water by 9:25 P.M. The procedure involved Section Leaders who received food rations from the central supply point and distributed allotted amounts to persons in their sections via a moving-point system. This method was employed throughout ES IX.

Three meals a day were scheduled during ES IX. As the study continued, water-siphoning problems occurred, record-keeping lagged, distribution methods became less and less sanitary, and methods of getting supplies to the shelterees became generally more relaxed.

#### C. Medical Complaints

##### 1. Medical History Questionnaire

Applicants for ES IX completed Medical History Questionnaires, used to screen shelterees with conditions likely to be aggravated by confinement. During ES IX, a medical room was maintained on the first floor of the Costa Building, and two physicians and three nurses served as the in-shelter medical team. Ambulance service and both local hospitals were notified in the event emergency treatment was needed.

##### 2. Medical Aspects of Pre-Shelter Processing

As part of the processing procedure, all subjects were questioned concerning their current state of health on Medical Inquiry Referral forms used by CDR interviewers. Two physicians and three registered nurses were on hand to examine all subjects fifty years of age and older and any subject who presented current medical complications. No subject was rejected for medical reasons.

### 3. Medical Supplies and Personnel

In addition to the standard Medical Kit C, supplementary medical supplies were stocked based on recommendations from previous shelter physicians (see Table 12).

The two in-shelter physicians stood alternate eight-hour shifts. The three registered nurses served an eight-hour shift on a similar rotational basis. Each medical team maintained accurate records of both medical complainers and their medical complaints. Medical team duty within the shelter was structured by the Handbook.

During the temporary phase on 29 April, the medical area was established in the southwest corner of the shelter by the Temporary Medical Officer, and partitioned off by stacked water drums. After the permanent phase began, the medical area was moved to the main shelter entrance by the medical team. This move provided better use of floor space and facilitated the rotation of the medical team every eight hours.

Shelterees requesting release prior to the end of the study were given a medical examination by the physician, who filled out a Defection Medical Report.

All physicians and nurses were required to write post-shelter medical evaluations of ES IX, and their comments may be found in the last part of this section.

### 4. In-Shelter Medical Complaints

The nature of medical complications during ES IX partly followed the pattern of previous studies. The most frequent medical complaint was headache, which was registered on the in-shelter medical record a total number of fifty-eight times (see Table 13). Shelter physicians suggested that some headache causal factors may have been the ready availability of medication, as well as poor ventilation and stuffiness within the shelter.

The majority of medical complaints occurred Saturday between the hours of 7:00 A.M. and 3:00 P.M. A total of thirty-three complaints were registered during that time. From 3:00 P.M. on Saturday through 11:00 P.M. that night, eighteen complaints were recorded. The time period ranking third in regard to the frequency of complaints registered was Sunday between the hours of 7:00 A.M. and 3:00 P.M., when fifteen complaints were recorded (see Table 14). Twenty-seven females and twenty-three males registered medical complaints. Females complained more of headaches and nausea than males, while males

Table 12

CDR Supplements to Medical Kit C  
(ES IX)

Item	Stocked	Used	Unused
Ammonia, aromatic l2s	1 box	0	1
Benadryl, 25 mg.	1 btl.	0	1
Benadryl, elixir, 4 fl. oz.	4 btls.	4	3 1/4
Benylin Expectorant, 4 fl. oz.	2 btls.	2	0
Dextran, 6% w/v in dextrose 5%, 500 ml.	1 btl.	0	1
Dextrose, 5% in water, 1000 ml.	1 btl.	0	1
Dramamine	12 tabs.	2	10
Ephedrine Sulphate Injection, 1 ml./l2s	2 pkgs.	0	2
Epinephrine Injection, 1 fl. oz., 1:1000	1 vial	0	1
Furacin Soluble Dressing, 28 gms.	3 tubes	0	3
Morphine, 30 cc., 16.2 mg./cc.	1 vial	0	1
Sodium Chloride Injection, 1000 ml.	1 btl.	0	1
Adhesive Tape, 2" x 5 yds.	1 roll	0	1
1/2" x 10 yds.	3 rolls	2	1
	(partially)		
Band-Aids, 56 assorted	3 boxes	4	164
Cot, aluminum folding	1	1	0
Cups, folding, paper 100s	1 box	1	0
Forceps, small tip	1	0	1
Milk, powdered	1 box	1	0
Notebook, looseleaf	1	1	0
Respiration Tube	2 (adult)	0	2
	2 (child)	0	2
Syringe, plastic, 22 g.	6	0	6
25 g.	15	0	15
Thermometer Container, plastic	2	0	2
Thermometer, oral	3	1	2



Table 13  
In-Shelter Medical Complaints by Shift and Sex Group  
(ES IX)

Diagnosis	Shift																		Total*					
	Fri. 3-11			Sat. 11-7			Sat. 7-3			Sat. 3-11			Sun. 11-7			Sun. 7-3			Sun. 3-11					
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T			
Headaches	-	2	2	1	-	1	14	13	27	6	10	16	-	1	1	3	7	10	-	1	1	24	34	58
Cold, sore throat	-	-	-	-	-	-	1	2	3	1	-	1	-	-	-	2	-	2	-	-	-	4	2	6
Cuts and abrasions	1	-	1	-	-	-	-	1	1	-	-	-	-	-	-	2	-	2	-	-	-	3	1	4
Nausea	-	-	-	-	1	1	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
Miscellaneous <sup>b</sup>	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	1	1	1	1	2	1	3
Nervous	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Total	1	2	3	2	1	3	15	18	33	8	10	18	-	1	1	7	8	15	1	1	2	34	41	75

\*A shelteree could have more than one complaint. (Twenty-seven females and 23 males accounted for the 75 medical complaints in this table.)

<sup>b</sup>Knee pain, sinus, wart.

Table 14  
Daily Number of Shelterees with Medical Complaints  
(ES IX)

Shift	Age Group	Male	Female	Total
Friday 3-11 P.M.	0-12	0	0	0
	13-19	0	0	0
	20-39	1	1	2
	40-54	0	0	0
	55+	0	1	<u>1</u> 3
Friday 11 P.M.- Saturday 7 A.M.	0-12	0	0	0
	13-19	0	0	0
	20-39	2	1	3
	40-54	0	0	0
	55+	0	0	<u>0</u> 3
Saturday 7 A.M.- 3 P.M.	0-12	3	1	4
	13-19	1	0	1
	20-39	6	8	14
	40-54	3	4	7
	55+	2	5	<u>7</u> 33
Saturday 3-11 P.M.	0-12	1	0	1
	13-19	0	1	1
	20-39	4	6	10
	40-54	3	3	6
	55+	0	0	<u>0</u> 18
Saturday 11 P.M.- Sunday 7 A.M.	0-12	0	0	0
	13-19	0	0	0
	20-39	0	0	0
	40-54	0	1	1
	55+	0	0	<u>0</u> 1
Sunday 7 A.M.- 3 P.M.	0-12	3	1	4
	13-19	0	0	0
	20-39	4	3	7
	40-54	0	3	3
	55+	0	1	<u>1</u> 15
Sunday 3-6 P.M.	0-12	0	0	0
	13-19	0	0	0
	20-39	1	0	1
	40-54	0	0	0
	55+	0	1	<u>1</u> 2
Grand Total				75

complained more of colds and sore throats, cuts and abrasions, and miscellaneous problems.

#### 5. The In-Shelter Physicians' Roles

The two physicians assumed different approaches to the shelterees. One doctor was aggressive in his willingness to help subjects with their medical problems. He made rounds throughout the shelter every two hours asking how each shelteree felt. The other physician assumed the opposite role. He did not make rounds and appeared reluctant to prescribe medication for complaining shelterees when they came to the medical area, e.g., "Come back to see me in thirty minutes if you're not feeling better." At the termination of the study, the latter physician had seen one more patient than had his colleague, suggesting that factors other than the physician's role were causing shelterees to seek medical help.

#### D. Post-Shelter Medical Reports

The physicians and the nurses submitted reports of their observations after the study was completed. These reports are presented below in their entirety. (In the following passages, one "\*" refers to a CDR supplementary medical kit item, and two "\*\*\*" refer to an OCD Medical Kit C item.)

##### 1. Physicians' Reports

###### Physician No. 1:

The following evaluation represents impressions formulated during alternate eight-hour periods over forty-eight hours within the shelter confines.

1. An assay of Medical Kit C with supplementary items in ES IX is as follows:

###### (a) Unnecessary Items:

- (1) Morphine\*. Although this narcotic is indicated in certain medical emergencies, I do not feel its presence in the kit constitutes a necessity. Due to prompt and hazardous respiratory depression, possibly in the hands of a layman utilizing this drug there would be considerable hazard of over-dosage and secondary sequelae thereof.
- (2) Dextran 6% in D<sub>5</sub>W\*. This plasma volume expander has definitely proven its efficacy in certain medical conditions such as shock states (burns, acute bleeding, trauma injuries, as well as anaphylactoid-purpuric situations);

however, since the medical kit in the shelter is provided to meet the needs of the people within a shelter rather than be a veritable emergency room, I feel it should not be included. Allergic responses to Dextran, which must be given intravenously, have been reported in the medical literature. IV administration in the hands of a layman would likely prove difficult and not efficacious to the best well being of the patient.

- (3) The quantity of Sulfadiazine in Kit C is approximately 3,000 7½ grain tablets. Although sulfa certainly has its indications, its primary usage is with regard to acute urinary tract infections. The incidence of allergic reactions to sulfa is alarming; however, they are usually of a mild nature, consisting of a rash/erythema and short lived. I do not feel that more than 1,000 tablets need be supplied for 300 people over a two-week period, in that I cannot foresee need for such excess quantity of an antibiotic used for such narrow coverage.

(b) Additional items I feel would be necessary under realistic shelter conditions include:

- (1) Light source (lantern with batteries) in order to facilitate locating and dispensing of medications at night.
- (2) Tourniquets in the event IV medication is required of a life-saving nature.
- (3) A small roll of string (approx. 50 feet) to appropriately tag objects, bodies (in event of a person's decease), or even more remotely to tie off the umbilical cord in the event of a childbirth.
- (4) Splints (one- and two-feet long and three inches wide) made of plywood need to be available should trauma occur and immobilization be necessary.
- (5) Small container (metal) to place contaminated thermometers for sterilization.
- (6) Rectal thermometers to be utilized in taking temperatures of infants and small children.
- (7) Measuring containers (5cc) which are essential for accurately dispensing elixirs.
- (8) Paper towels (500).
- (9) Sugar cubes (500) to be given with water to children to control diarrhea.

- (10) IV phenobarbital is necessary to control a seizure disorder which could give control over a situation which might well produce hysteria on behalf of the entire group of shelterees should the seizure persist. Phenobarbital is such an excellent drug when used wisely, that its presence in all methods of administration (orally, intramuscularly and intravenously) would be quite an asset to the medical officer in charge.
  - (11) A small brightly colored cigar-sized box to contain all IV medication (ampules) and other potentially dangerous medications could be quickly obtained, utilized, and re-stored without being readily misplaced.
  - (c) Non-included items I feel should replace currently provided items include:
    - (1) Demerol should replace morphine. I strongly feel that a potent analgesic is necessary and that Demerol constitutes fewer over-all hazards.
    - (2) Although the plastic containers for the thermometers are good for keeping them sterile till used, they serve no useful purpose once opened. Instead, a small metal container or basin for re-sterilization would be more useful.
  - (d) Over-all, I feel that Medical Kit C and supplementary items are quite adequate to handle the large majority of problems that might arise in a shelter population to be operated by responsible laymen.
2. Virtually 99% of the medical complaints received were concerned with "headache" localized to the frontal area. Few, if any, of the persons seemed to be in any distress from headache discomfort. It was my feeling that the large majority was psychological (without organic basis) in origin and due to one of the following factors:
- (a) Via suggestion from a relative or friend who concomitantly "had a headache, too."
  - (b) The majority of persons requesting headache medication, by history, are taking medicines at home for a variety of medical problems--sinus, asthma, bronchitis and "nerves." These individuals are more susceptible to requesting medications when they find out it is readily available--a definite psychoneurotic predisposition.
  - (c) Poor ventilation and stuffiness, especially after periods of generalized activity.

Of interest was the fact that virtually none of the persons openly admitted that their headache was due to the tight shelter confinement, which I'm sure added considerable stress to amplify psychoneurotic tendencies which would be manifest as "headache."

There were less than 1% respiratory and gastro-intestinal disorders. Diarrhea was not reported to me, which was surprising in that I had expected some acute gastro-enteritis secondary to the strange (or "different") water supply and decreased food intake. Nausea was reported in two adults--one defected from the study, and the other person is presently taking tranquilizers.

3. Trends in the nature of complaints centered about discomfort in the A.M. hours after awakening or rather from a poor night's sleep. Also, a goodly number of complaints seemed to occur prior to afternoon rest period and before bed time in hopes that same would not be present upon awakening. These persons were denied medication and in lieu were asked to sleep to shake off the disorder. All complied readily. However, approximately 50% returned again to request medication which was granted.

A longer period of confinement would have produced a larger number of complaints--more headaches and "nerves." Also, I would expect nausea to ensue next and then either diarrhea or constipation due to the markedly altered food pattern and content. Respiratory complaints would then develop, likely from excess dust and poor ventilation.

Of note was that as the study progressed, more injuries (cuts, abrasions) occurred secondary to increased activity despite the confined quarters.

4. General sanitation was handled quite well. The group repeatedly swept the entire shelter area to get rid of debris, unused food, etc. The manner of sanitation control was handled quite well by all concerned.

The toilets were kept neat and clean throughout. The de-odorizer tablets were not discovered nor utilized until approximately nine hours before termination of the study. The toilets were evacuated daily and removed from the shelter area. NO complaints of odor were received. Everyone encountered some toilet discomfort, but all seemed to be quite surprised (including myself!) that all went well without any "leaks."\* A wash basin was set up outside the toilet, and the water was changed after every 15 persons utilized it.

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\*Apparently this physician was unaware of the leaky commode problem.

5. The Handbook instructions for medical personnel are concise, lucid and should pose no difficulty to a conscientious layman. I feel that the largest majority of medical problems which might arise in a shelter are adequately covered. The stocked booklet, MEDICAL CARE IN SHELTERS, is well organized and presented; however, I wish to make one recommendation: The booklet does not contain drug dosages which would be of vital importance in the disposition of medication. I would like to suggest that the kit either contain a Physician's Desk Reference (PDR) or excerpts accordingly from the PDR regarding the contained medications. This would render considerable reassurance to the dispenser of medication to know their dosage, indication, complication and contraindication.
6. The defections which occurred during ES IX were due predominantly to either, or combinations of, the following:
  - (a) Being misinformed regarding the study concerning personal belongings, space, etc. prior to arriving.
  - (b) Inconvenience caused by not coming "as fully prepared" as others with regard to the niceties of life as brought by many of the shelterees.
  - (c) Personality clashes with the administrators of the shelter in the disposition of duties.
  - (d) Excess moving of belongings and separation of families.

NO defections were necessary from a medical point of view during my stay in the shelter.

7. During my stays in the shelter, almost all of the actual organization of duties had begun and was progressing smoothly. Therefore, I feel quite inadequate in commenting on shelter organization and management.

Not one of the 150 participants in the study came over to inspect the medical kit nor to volunteer their services. In the event of an actual disaster, there is a good possibility that a nurse and physician will not be available. Hence, I feel that the Shelter Handbook should place emphasis on having several individuals knowledgeable regarding the usage of the medical kit and its contents.

The reduced space allotment to me has rendered the conclusion, that although life continued, the space situation is far from desirable. Marked discomfort with inability to sleep resulted in increased irritability and decreased performance in execution of the shelter activities with ease.

Physician No. 2

Medical Kit C Evaluation:

Cascara - Forty-eight hours is a very short time to evaluate a change in bowel habits. We did have one complaint of constipation, but the shelteree was reluctant to take a laxative in order to avoid the shelter toilet. Over a period of two weeks with only the crackers as food, lack of bulk with the resulting constipation will necessitate this drug.

Petroleum Jelly - This was not used during the study and will probably be of little use in long term studies. Two jars are certainly adequate.

Bicarbonate - We did have a few complaints of gastric distress. Because of the changing pattern of food habits and because of the inter-relationships of gastric and psychological distress, I feel that this is a useful drug for the medical kit. The quantity is adequate.

Penicillin and Sulfadiazine - I feel that both of these drugs are necessary, even though we did not use one pill of either in the study. Over a longer period of time, various bacterial infections will certainly develop, and both drugs are of use in this situation.

Eugenol - Toothache was not a problem here, and unless the pain is quite severe, aspirin would be adequate. Eugenol certainly is not definitive therapy, as it will not relieve the cause of toothache. It only hides symptoms.

Sodium Chloride - Heat prostration was not encountered here, but this could certainly be present. This is a necessary drug.

Tongue Depressors - Not used in this study and of value only to a physician.

Eye and Nose Drops - Not used in this study but could be of value in longer stays. Would recommend that this drug be stocked in the same quantity for 300 people for 2 weeks.

Soap - Hexachlorophene soap is definitely necessary. The quantity supplied is adequate for a two-week period.

Phenobarb. - Although only a few tablets were used in this study, we could see that tensions were beginning to mount as the study concluded. This drug will be an absolute necessity after four or five days in the shelter. I feel that the 32mg tablet is the best form.



Aspirin - As necessary as all others combined. Supply adequate.

Alcohol - Supply adequate. Would suggest zephiran also, as this is not as painful when applied to cuts and abrasions.

Kaolin and Pectin - This also was not used in the short-term study; however, after more time is spent in the shelter, a change in eating habits combined with improper food handling will cause diarrhea and necessitate this drug.

Water Tablets - These are of course necessary, but the complete supply was used for the two-day study. This may not be true, since the shelteree in charge of the water supply may have pilfered the supply.

CDR Supplementary Drugs:

Ammonia - Although not used here, is a valuable drug to have available. Benadryl tablets and elixir are also valuable. Due to the close quarters, colds will flourish. Because of the dust, allergy will also become a problem. Benadryl will combat both. Benelyn expectorant is a Benadryl derivative. Although this is a fair cough preparation, I feel that the cough syrup used should be one that works by a different mechanism than a drug already stocked. Sudafed is such a drug. Norisodrine is another.

Dramamine - A useful drug. We did have a few complaints of nausea and felt that such a preparation should be included in the medical kit. 150-200 tablets should be adequate for two weeks.

Dextran - Should not be included. To be used only by M.D.

Dextrose and Water - Not necessary. Anyone this ill will probably be taken to a hospital and will not reach a fallout shelter. The shelter should be primarily for well patients.

Furacin, Sodium Chloride Injection, and Ephedrine Sulfate - Not necessary. The latter two are of use only to the medically trained.

Milk (Powdered) - May be of value to infants who refuse crackers.

Adhesive, Forceps, Safety Pins\*\*, and Scissors\*\* - Valuable.

Syringes and Epinephrine - Of value in allergic reactions. For other situations a lay person would not be able to use these rapidly enough to be of value. Benadryl will also combat allergy.

Respiration Tubes - Many persons are trained in the use of such tubes. These are an asset to the medical kit.

Morphine - Not only do I see little use for this addicting drug in a well patient population, but also there is the possibility of this drug falling into untrained hands.

Many of the drugs are valuable only in trained hands. For this reason I would suggest having one kit marked for physician only. This would remove from the lay public the responsibility of handling such drugs as morphine, dextran, and dextrose and water. While in the shelter we set up one box as an emergency kit containing respiration tubes, epinephrine, ephedrine sulfate, morphine, ammonia, and syringes. I feel that this would be of value if a true emergency did develop.

In addition to the items in the kit, I feel a light of some type, a rubber tourniquet, and a spoon or measuring cup should be included.

Our major complaint was headache. When the individuals were questioned, 80% admitted to having daily or frequent headaches; 20% stated that they were not usual victims of headache. The closeness and the noise combined with a lack of sleep is certainly enough tension to cause headache.

For the first fourteen hours, medical complaints were minimal. At this time, the M.D. in the shelter began to make rounds of the shelterees at 1 1/2-2 hour intervals. He would ask if everyone felt well or if there were any medical complaints. Patients were asked to come to the medical area if they desired medication. Headaches began to sky-rocket. The M.D. gave aspirin readily. Severe headaches were handled with phenobarbital. At the end of his shift, this M.D. was replaced by one who did not solicit patients and who gave medication only after being asked more than once. Less medication was dispensed, and many patients returned to state that their complaint had disappeared after they had taken their desired medication--as if to say "I told you so." As indicated previously, I feel that there will be an increase in bowel complaints such as diarrhea and constipation in a prolonged study. Allergic nasal drip due to dust and colds will appear after a week or less.

Sanitation is always a major problem. A hand-washing area should be set up for those who use the toilet and for those who handle food. Fecal-oral contamination will lead to diarrhea. I have no suggestion in this area aside from making the medical staff responsible for this area. They, as health personnel, are less likely to shirk this distasteful duty.

The medical handbook gives a fairly good account of management of minor disease, but it does not indicate doses of drugs. For lay public this could be disastrous.

Defections that occurred during ES IX were due to lack of information on the part of the subject. Most expected to stay with many comforts for the 48-hour period. They had no idea of being so cramped for space and having no privacy. Personality problems were involved somewhat, but it is difficult to determine a general reason which will fit each case. No defections were due to medical necessity.

Without phenobarbital, I find it difficult to believe that people can survive in a shelter with only six square feet for two weeks. I found it interesting that the permanent and temporary staff were all white. Many shelterees were somewhat hostile that the medical staff entered and left at eight hour intervals.

The shelterees awoke on Sunday with a sense of pride which lasted the entire day.

## 2. Nurses' Reports

### Nurse, 7 A.M. - 3 P.M.:

The ES IX Medical Kit C supplies and medications were adequate to care for 300 persons confined to the shelter for the specified period of time. In reviewing the medical handbook and the supplies I found some items which were necessary, while others seemed unnecessary.

The injectable morphine\* might prove to be important in extreme emergencies. It might prove more valuable in pre-measured doses which would prevent errors by the layman. The syringes are disposable and would be much more useful and prevent contamination.

Dextrose\*, dextran\* and sodium chloride\* for intravenous use would be of great help in a real emergency, but they could only be used if there were someone in the shelter capable and experienced in giving an infusion; therefore the kit could well do without these fluids.

Since I frequently work in the obstetrical department, I was particularly interested in the care of the patient in labor. The handbook gave adequate instruction to the delivery of a baby, yet the kit was lacking in something to tie the cord; this should really be included in the kit.

A rectal thermometer should be included to take temperatures of smaller children and infants. It might also prove to be of value to include plastic thermometer holders.

Injectable Dramamine\* and morphine\* are good ideas, but instructions for administering an intramuscular medication should be given. It could prove hazardous to have someone inexperienced with this type of medication responsible for administering it.

Since the only type of cleansing solution included was alcohol, merthiolate might prove valuable for cuts and other wounds.

The majority of complaints received medically was those of headaches. These seemed to increase in frequency by mid-afternoon. Usually by this time everyone was tired from the long morning and was probably tense and on edge due to confinement. The majority of complaints received was from the adults, which could indicate that children adapt more readily to being confined. There were some complaints of nausea, cough, and cuts. These problems were easily taken care of by the medical kit.

The general sanitation was handled much better than I expected. The shelterees did a good job keeping everything as clean as possible. However, nearly 14 hours had passed before any of the shelterees made any effort to provide hand-washing facilities. With some encouragement from one of the physicians, they provided a hand-washing area.

The medical care book was easily understood and very good. I think a section about the use, dosage and side effects of stocked medicines should be included as an aid to the person in charge.

The defections which occurred while I was in the shelter were not really medical problems. One family of three left because "shelter life was worse than expected."

A middle-aged woman came to the medical area complaining of headache; later she defected the shelter because aspirin and phenobarb. did not relieve her. Another woman of the same age left the shelter because of a severe headache, which was relieved temporarily by the aspirin and phenobarb.

As a whole, the organization and management of the shelter was good. Everyone worked hard to make the experiment worthwhile and educational. The handbook for the shelter manager and the medical care book were both good and would be of great value in an emergency.

Nurse. 3 - 11 P.M.:

The following evaluation of the various medical aspects of ES IX is submitted; it includes individual evaluations and recommendations.

In ES IX, Medical Kit C and the supplementary items are assayed for 300 persons confined for two weeks under realistic emergency conditions. Medicines that seemed unnecessary were morphine\* and Ephedrine Sulfate\*. These are considered dangerous for administration by unskilled persons. A kit especially marked to be used by physician might be employed in each shelter medical supply.

Additional items felt necessary under realistic shelter conditions are: a tourniquet, for intravenous medications; a light suitable for

storage, as there may not be even a flashlight in an entire shelter; a wooden splint, even in a shelter study; a medicine cup for measuring liquid medications; Aqueous Zephiran 1:1000, as a skin antiseptic.

Benylin Expectorant\* might be replaced by a more effective cough preparation.

In the supplementary medical kit the adhesive, Band-Aids, syringes, thermometers, ammonia, Benadryl, Dramamine, epinephrine, as well as the small-tip forceps and folded paper cups will be of benefit.

Headaches were the most frequent complaints. Persons asked stated that they had headaches on other occasions.

In longer periods of confinement, other medical problems are likely to arise, such as nausea, indigestion, cuts and scratches, insomnia, nervousness, nasal congestion, and upper-respiratory infections.

Instruction for disposal of waste would be helpful to include in the medical manual, since this is the concern of any medical person. The drinking cups and the care of same should be emphasized by the Section Leader.

The booklet Medical Care in Shelters is adequate. Excerpts from the Physicians Desk Reference on all stocked medicines would be beneficial, especially to allied medical workers.

Defections were due to inadequate space. There were no medical defections.

The general organization and management was satisfactory. The reduced space allotment was undesirable. The placing of families in the middle with single persons on either side seems the best arrangement.

It was good to have the supplies and medicines that were added for this study. It is hoped that these items will be determined necessary after evaluating the post-shelter medical reports.

Nurse, 11 P.M. - 7 A.M.:

I felt that almost all medical items were necessary for realistic emergency conditions. There would be some controversy over the use of the intravenous fluids\*. Unless there were some trained medical personnel to administer these types of medications, this procedure could be very dangerous. I think insulin would be necessary under realistic shelter conditions. Diabetics would probably have their own supply, but it would be helpful to have an extra supply of insulin in an emergency situation.

It would be helpful to have some drug such as a Darvon Compound included in the medical supplies which are stocked by the federal government. Darvon could be used to supplement the supply of aspirin and would prove to be a valuable aid in "curing" the aches and pains of shelterees who had been issued the usual dosage of aspirin. The psychological effects of a drug which one doesn't know the name of and cannot recognize readily can do wonders for the real or imagined psychosomatic illnesses which could arise in the emergency situation.

It would be nice to have cotton balls with alcohol in a small container for personal use in giving shots, cleaning, etc.

Morphine\* is a medication which is given in acute pain and discomfort. This medication is a respiratory depressant, and the person receiving this drug should be watched very carefully for after-effects. Some other narcotic or hypnotic drug would be just as effective and much safer.

The number of complaints I had was limited, hence it is difficult to relate shelter confinement and comfort factors to usual, normal every-day life. Most of the complaints we received would have been made if the persons had not been in the shelter. One participant was an extremely nervous person with a history of ulcer and other gastrointestinal disorders. He was the type person who probably would have complained of headache in any event.

One female shelteree was taking an oral birth control pill - brand name, Enovid. Her complaints were nausea and vomiting. She stated that unless she was able to eat while engaged in consumption of this pill, she would be physically sick. This could be a problem of shelter confinement. She was very upset because she was unable to stay with her husband at night and stated that she had been told that they would not have to be separated during the course of the shelter exercise.

In evaluating shelteree comments, there is a possibility that shelter confinement did contribute to and influence their complaints. However, in my opinion, this is highly improbable.

Complaints made to me were limited. I was unable to note any particular trend in the nature of complaints. There are numerous medical problems that could arise, but the medical kit and the supplementary drugs would sufficiently take care of most minor medical problems.

The general sanitation situation was fairly good. However, there was much trash, cigarettes, etc., on the floor. This problem could have been eliminated by good housekeeping chores. Trash could present a problem if allowed to accumulate over an extended period of time. The problem of smoking was a real one during my shift of 11:00 P.M. to 7:00 A.M. Its magnitude was amplified by the time factor; night. There should be some definite area for smoking, and the number of individuals permitted to smoke at the same time should be rigidly controlled.

I feel that smoking could be both a fire hazard, and that a generally unpleasant situation could result from the excessive smoke.

There was only one defection that occurred during my shift. The dominant reason for its occurrence was strictly psychological. This particular shelteree was irritated by the crying of a baby and stated it was all he could take. He was under the impression that he could have studied for a forth-coming exam, but it was just too noisy for any type of concentration. This departure was not necessary from a medical point of view.

The general organization and management of the shelter was good. This being my first exercise, I have no basis for any negative or positive comparison. I do think everything went very smoothly considering the area, the number of people, and the time element involved. A certain amount of personality conflicts and other problems arising whenever people are engaged in a shelter exercise or any social gathering are inevitable. I believe that the most important function of the shelter manager and his staff is in establishing communications between organizational personnel and the shelterees. If this can be established early in the exercise, then the entire stay will be most enjoyable and serve a useful function.

#### E. Shelteree Reactions

##### 1. Shelter Diaries

All shelterees were instructed to fill out an unstructured Shelter Diary twice daily, 9:00 A.M. and 9:00 P.M., during the period of confinement. Diary forms were the same as used in ES VIII with one modification: shelterees were asked to indicate whether or not they held a temporary or permanent staff position and, if so, the name of the position. Diaries were grouped according to age and sex. The age breakdown utilized was identical to that used in ES VIII, i.e., 1-7; 8-16; 17-23; 24-30; 31-40; 41-50; 51-70. From a total of 369 diaries, 602 comments were scored. Criteria for scoring these comments were the same as used in ES VIII and may be found in the 1965 Final Report entitled Shelter Occupancy Studies at the University of Georgia (Hammes, et al.).

Table 15 and Figure 1 depict the relative daily percentages of positive and negative comments by both males and females. It can be seen that the low ebb of the study occurred Saturday morning, since more negative comments and less positive comments were made at this time. Diaries completed after this time revealed a continual increase in positive comments and a gradual decrease in negative comments so that by Sunday morning the percentage of positive comments reached its peak and the percentage of negative comments reached its lowest point. There was

Table 15  
Unstructured Diaries--Frequencies and Percentages of Positive  
and Negative Comments Made Each Morning and Evening  
(ES IX)

Day	Date	Male Percentage		Female Percentage		Total Percentage	
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
Friday (afternoon)	4/29	44.8	55.2	57.8	42.2	52.5	47.5
Saturday (morning)	4/30	41.7	58.3	38.2	61.8	39.8	60.2
Saturday (afternoon)	4/30	58.5	41.5	64.1	35.9	61.8	38.2
Sunday (morning)	5/1	83.6	16.4	86.5	13.5	85.2	14.8



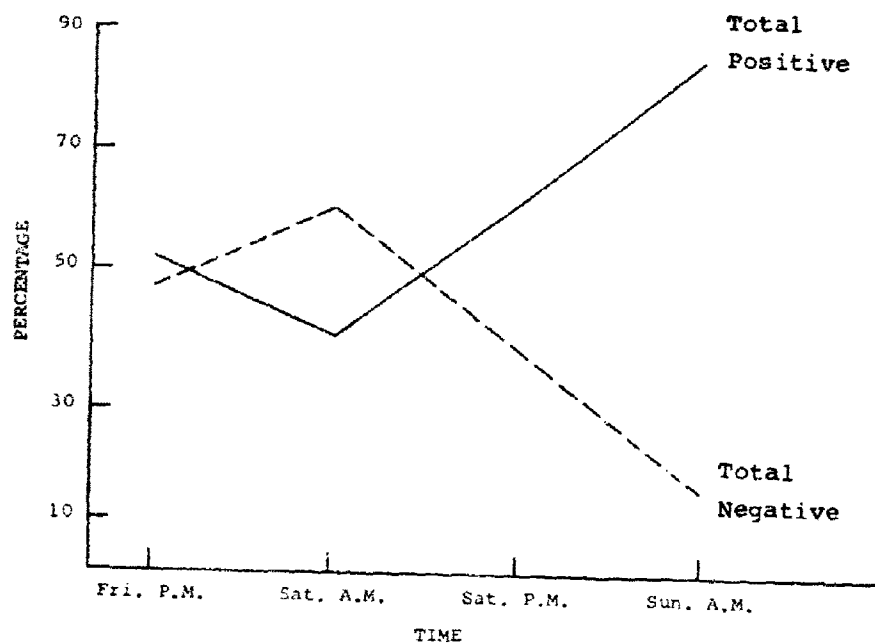
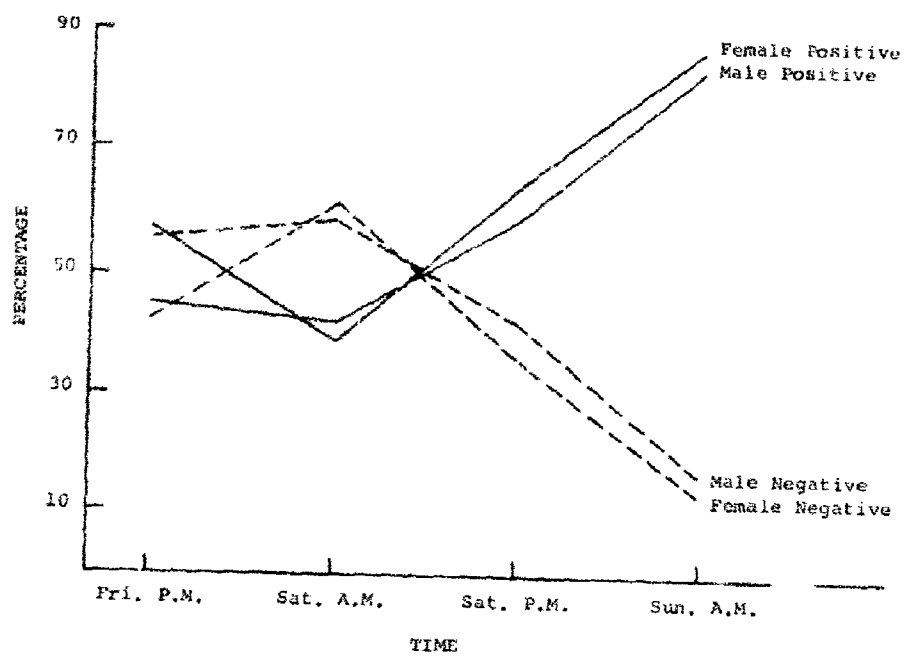


Figure 1. Percentage comparisons of frequencies of positive and negative diary comments made each morning and evening (ES IX).

approximately a 2:1 ratio of positive to negative comments in the diaries, in terms of the total number of comments made over the entire weekend.

Table 16 reveals the percentages and frequencies of positive comments made by both males and females for various categories. These categories are rank-ordered for the total population. Table 17 is a similar record for negative comments. As in past studies, shelterees tended to make very general positive statements but, as a rule, were more specific about what they disliked. For example, 29.5% of the total positive scores were "Generally Positive," whereas only 3.8% of the total negative scores were "Generally Negative," since the remaining percentage of negative comments were clearly classifiable.

a. Space

Of all negative comments made, 23.0% were complaints about limited space. Both males and females complained about space to the extent that it became the top negative item with 6.4 square feet of space per person, few shelterees could recline without overlap or personal contact.

b. Food and Water

Comments regarding food and water were few. In order to assess what percentage of comments were made regarding food and water, several categories related to this area were grouped: Food, amount of food, candy, crackers, water, amount of water, and hunger. It was found that of all positive comments made, 9.7% pertained to food and water, whereas 7.1% of all negative comments were related to this area. Day by day positive comments in this area decreased, and negative comments tended to increase.

c. Sleeping

Of all positive comments made on the diaries, 6.3% were scored in the sleeping category. Of all negative comments made, 7.1% were scored in this category. A portion of the space utilization plans implemented by the CDR staff was the target of complaints. The majority of negative comments regarding space utilization concerned the dislike of Friday night's sleeping arrangements. The consensus of opinion seems to be that the shelterees were able to sleep much better Saturday night, at which time all were allowed to sleep at one time. Presumably, the high percentage of "Tired" complaints was due to the Friday night's sleeping arrangement.

Table 16  
Unstructured Diaries--Positive Comments for  
Male and Female Shelterees  
(ES IX)

Comment	Male		Female		Total	
	Freq.	Percent <sup>a</sup>	Freq.	Percent <sup>a</sup>	Freq.	Percent <sup>a</sup>
Generally positive	48	32.4 <sup>b</sup>	59	27.4	107	29.5
Other people	14	9.5	37	17.2	51	14.0
Physical feeling	18	12.2	24	11.2	42	11.6
Sunday service	11	7.4	15	7.0	26	7.2
Sleeping	13	8.8	10	4.7	23	6.3
Things better	9	6.1	9	4.2	18	5.0
Activities	5	3.4	10	4.7	15	4.1
Cooperation	4	2.7	8	3.7	12	3.3
Food	5	3.4	7	3.3	12	3.3
Hungry	4	2.7	8	3.7	12	3.3
Space utilization	4	2.7	8	3.7	12	3.3
Staff	3	2.0	--	--	--	--
Water	3	2.0	--	--	--	--
Total scorable comments = 148    Total scorable comments = 215    Total scorable comments = 363						

<sup>a</sup>Only comments with a percentage of two or above are included.

<sup>b</sup>To be interpreted that 32.4% of positive comments made by males fall in this category.

Table 17

Unstructured Diaries--Negative Comments for  
Male and Female Shelterees  
(ES IX)

Comment	Male		Female		Total	
	Freq.	Percent <sup>a</sup>	Freq.	Percent <sup>a</sup>	Freq.	Percent <sup>a</sup>
Space	29	26.9 <sup>b</sup>	26	19.8	55	23.0
Tired	13	12.0	18	13.7	31	13.0
Physical feeling	7	6.5	14	10.6	21	8.8
Sleeping	9	8.3	8	6.1	17	7.1
Space utilization	6	5.6	10	7.6	16	6.7
Generally negative	9	8.3	--	--	9	3.8
Floor	4	3.7	3	2.3	7	2.9
Too hot	6	5.6	--	--	7	2.9
Separation from family or spouse	4	3.7	3	2.3	7	2.9
Hungry	--	--	3	2.3	5	2.1
Supplies brought in	3	2.8	--	--	--	--
Water	--	--	4	3.1	--	--
Food	--	--	3	2.3	--	--
Lack of bathing facilities	--	--	3	2.3	--	--
Noise	--	--	3	2.3	--	--
Organization	--	--	3	2.3	--	--
Smoking	--	--	3	2.3	--	--
Toilet	--	--	3	2.3	--	--
Total scorable comments = 108		Total scorable comments = 131		Total scorable comments = 239		

<sup>a</sup>Only comments with a percentage of two or above are included.

<sup>b</sup>To be interpreted that 26.9% of male comments fall in this category.

#### d. Activities

In order to ascertain how the shelterees felt about activities and organization in the shelter, the following categories were grouped: Activities, boredom, exercise, lectures, not enough activities, organization, recreation, Sunday service, and time. Generally, the positive comments regarding these areas increased across confinement days, while negative comments remained very low or were nonexistent. Of all positive comments made, 13.8% pertained to activities, while 3.1% of all negative comments were related to activities.

#### e. People

Comments pertaining to other shelterees were scored in four categories: Other people, cooperation, staff, and children. Both males and females had a higher percentage of positive than negative comments, with females having a higher percentage than males. By collapsing these categories into one, it was found that 19.9% of all positive comments pertained to people, whereas only 2.9% of all negative comments fell in this area.

#### f. Morale

The percentages of daily comments in the categories generally positive - generally negative, things better - things worse, and total positives - total negatives were determined in order to find some indication of morale. The lowest percentage of positive comments occurred on Saturday morning (13.7%), whereas the highest percentage occurred on Saturday evening (27.7%).

Negative comments in these areas were sparse. On Saturday and Sunday mornings, 0.6% of the negative comments made were scored in these areas, while the highest percentage, occurring on Friday evening, reached only 2.8%. In this area it can clearly be seen what was stated earlier in this discussion, viz., shelterees tended to make general positive remarks but stated very specifically what bothered them.

### 2. Post-Shelter Questionnaire

The Post-Shelter Questionnaire was administered on the afternoon prior to emergence from the shelter. Ninety-four persons (45 males and 49 females), ranging in age from eight to sixty-five, completed the form. Their responses to shelter living obtained through the questionnaire follow.

a. Adjustment to Shelter Living

In an effort to get some idea of the shelterees' adjustment to shelter life, each was requested to estimate the number of days he would be able to remain in the shelter under the same conditions. Table 18 indicates the responses to this question. The average estimate for males was 6.2 days (median, 5.5 days); for females 5.5 days (median, 2.5 days).

Two additional questions indicated a favorable attitude on the part of the shelterees regarding their stay in the shelter (see Table 19). Approximately 90% responded positively when asked if they would have volunteered to stay in the shelter if they had known what it would really be like. Approximately 88% indicated that they would be willing to volunteer to stay in the shelter again sometime. This data excludes defections, who did not take the questionnaire.

The shelterees were given an opportunity to list any items they felt definitely should be added to the shelter stocks. Items suggested by 10% or more of the shelterees follow: Bunks or beds (16.0%), better or more varied food (11.7%), and storage space (10.6%).

When asked what three items they would bring for another shelter stay, the items mentioned by 20% or more of those filling out the questionnaire were: Bedding (85.1%), food (69.1%), and recreational items (23.4%) (see Table 20).

Shelterees were somewhat hesitant to mention articles they had brought with them but which they could have done without. Items mentioned by 10% or more of those completing the questionnaire were recreational items (19.1%) and clothes (12.8%).

b. Primary Discomfort Factors

Another part of the questionnaire was designed to reveal the factors contributing to the discomforts incurred during shelter living. Shelterees were asked to choose from seventeen listed factors and to rank those they considered discomforts. Food as a discomfort factor was omitted from the list of potential discomforts, since past measures of this sort have indicated food to be the primary complaint. As in past studies, most of the shelterees complied with the request to indicate discomforts, but the ranking of these was not done correctly by enough persons to warrant consideration here. The frequency of selection and percentage of persons making each selection is presented in Table 21.

Table 18  
Shelteree Estimates of Tolerance  
for Continued Confinement  
(ES IX)

Additional Days	Male	Female	Total Group
0	7	11	18 (20.0%)
1	1	4	5 ( 5.6%)
2	6	11	17 (18.9%)
3	2	4	6 ( 6.7%)
4	5	1	6 ( 6.7%)
5	9	6	15 (16.7%)
6	0	2	2 ( 2.2%)
7	4	0	4 ( 4.4%)
8	0	0	0 --
9	0	0	0 --
10	7	2	9 (10.0%)
15	0	0	0 --
20	0	0	0 --
30	3	5	8 ( 8.9%)
Total Responses	44	46	90
Mean Estimate	6.2 days	5.5 days	5.8 days
Median Estimate	5.5 days	2.5 days	3.5 days

Table 19  
Shelteree Evaluation of Shelter Adjustment  
(ES IX)

Question	<u>Male</u>		<u>Female</u>		<u>Total Group</u>	
	Yes	No	Yes	No	Yes	No
Would you have volunteered to stay in the shelter if you had known what it would really be like?	42	3	40	6	82	9
Would you volunteer to stay in this shelter again some-time?	40	5	40	6	80	11



Table 20

Shelteree Indication of Items They Would  
Bring for Another Shelter Stay  
(ES IX)

Item	Males (N=45)	Females (N=49)	Total (N=94)
Bedding	40	40	80 (85.1%)
Food	35	30	65 (69.1%)
Recreational items	9	13	22 (23.4%)
Water	9	7	16 (17.0%)
Clothes	3	11	14 (14.9%)
Toilet articles	4	8	12 (12.8%)
Wash/dry towelettes, washcloths, towels	8	2	10 (10.6%)
Bible	2	1	3 (3.2%)
Flashlight	1	2	3 (3.2%)

Table 21

Shelteree Indication of Discomfort  
(ES IX)

Item	Item Frequency by Age Groups					Total Group (N=94)*
	8-16 (N=21)	17-23 (N=17)	24-30 (N=17)	31-40 (N=12)	41-50 (N=18)	51-70 (N=9)
Poor sleeping conditions	17	12	12	7	9	5
No bathing	6	9	7	9	6	7
Space	8	9	8	4	8	1
Drinking water	8	8	8	2	2	3
No coffee	4	2	6	3	9	7
Nothing to do	10	5	5	3	5	1
Toilets	7	8	5	4	3	0
Noise	4	5	4	6	3	2
Smells	5	6	3	3	4	1
Tobacco smoke	8	3	2	5	2	2
Crackers	8	4	1	3	1	2
Dirty	2	5	5	4	1	0
Nighttime temperature	6	3	3	3	1	1
Not enough fresh air	9	2	2	1	1	0
Too warm daytime temperature	5	2	2	2	1	2
Too warm nighttime temperature	3	2	4	3	0	1
Daytime temperature	5	1	2	2	1	1
Other people	2	2	0	0	1	0
Too cool nighttime temperature	2	1	0	0	1	0
Shelter activities	1	2	0	0	1	0
Too cool daytime temperature	1	0	0	0	0	0
						1

\*Number of persons ranking items. Several items can be ranked by one person.

Five sources of discomfort were indicated by one-third or more of the persons who completed the questionnaire. In order of frequency of mention, these items were: Poor sleep conditions, no bathing, space, drinking water, and no coffee. These primary discomforts are discussed in the following paragraphs in order of frequency of mention.

"Poor sleep conditions" emerged as the greatest discomfort, being selected by 66.0% of those completing the questionnaire. Reasons for this factor emerging as the primary discomfort no doubt include not only the physical conditions in the shelter to some extent (hard floor, etc.), but also space utilization plans which were experimentally implemented by the CDR staff. Of the three sleep space plans evaluated--Friday night, Saturday afternoon, and Saturday night--the Saturday night plan was overwhelmingly the choice of the shelterees (94% preferred the sleeping arrangements implemented on that night). This plan allowed families to stay together and did not call for shift sleeping. It is felt that the unpopularity of Friday night's plan was a major contributory factor regarding the emergence of the poor sleep conditions category as the top discomfort.

Shelterees also were bothered by not being able to bathe, since 46.8% of those filling out the questionnaire indicated this factor to be a discomfort, placing it second on the list of discomforts. This was probably an accumulative effect, since this factor was relatively low on the earlier diary forms.

"Space" or lack of it emerged as the third greatest discomfort, being bothersome enough to be mentioned by 40.4% of those individuals expressing themselves on the questionnaire. Contributing to discomfort in this area no doubt was the inclination on the part of some of the shelterees to take up more than their share of room, and the refusal of some individuals to give up bulky personal possessions for shelter exclusion, such as air mattresses. Undoubtedly, the discomforts of crowded space and poor sleep conditions are related to each other.

"Drinking water" and "no coffee" were given an equal place on the list of discomforts; each was mentioned by 33.0% of the shelterees completing the questionnaire.

#### c. Shelter Organization

Other questions were asked in order to assess the shelterees' feelings regarding the organization of the shelter, both initially and at the time the Post-Shelter Questionnaire was administered. It was found that 55.3% of those completing this form had no complaints regarding

initial organization; they thought the shelter seemed well organized and managed. Another response indicated by 28.7% of the shelterees revealed it was not organized enough, while 16.0% thought some leaders had too much to do, and other shelterees not enough to do. Some shelterees (13.8%) indicated that there were too many people leading things.

Regarding the organization of the shelter at the time the questionnaire was filled out, 75.5% of those filling out the form indicated that they had no complaints; the shelter seemed well organized and managed. Other shelterees (12.8%) indicated some leaders had too much to do, while others did not have enough to do.



#### d. Shelter Activities

When the shelterees were asked to indicate what took up most of their time in the shelter, responses were as follows: 46.8% - talking, 42.6% - just lying around, 28.7% - playing cards or other games with a few people, 27.7% - reading, 16.0% - looking after their family, 14.9% - helping in operating the shelter.

The last question sought to ascertain what activities shelterees participated in actively. It was found that 24.5% participated in games, exercises, or other recreation. Other activities and percentages (above 10%) of shelterees responding follow: 14.9% - religious activities, 13.8% - special evening activities.

#### e. Defections

Twenty-two shelterees left the shelter before the scheduled exit time (twelve males and ten females). Fifteen of these left within twenty-four hours of entry. As judged by the physicians, there were no medical reasons to warrant early exit. Seven of the twenty-two left to accompany a

family member who defected. Of the remaining fifteen there were three married couples of which both husband and wife listed identical or similar reasons for early exit. It appears, therefore, that twelve dissatisfied individuals were responsible for twenty-two defections. A frequently listed reason for defection was "too crowded" (see Table 22). The age range of defections was from 1-57 with a mean of 19 years.

## VI. Environmental Variables

### A. Temperature and Ventilation

During ES IX, the overall mean outside dry bulb temperature (computed on the Temperature-Humidity Index (THI) meter readings) was 72.7°F, with a maximum dry bulb temperature of 85°F on April 29 and May 1, and a minimum dry bulb temperature of 64°F on May 1. The overall mean shelter area dry bulb temperature was 68.6°F, with a maximum dry bulb temperature of 75°F on April 29, and a minimum dry bulb temperature of 62.5°F on April 30.

The overall mean outside THI was 69.7°F, with a maximum index of 78°F on April 29, and a minimum index of 64°F on May 1. The overall mean shelter area THI was 69.8°F, with a maximum index of 71.8°F on April 29, and a minimum index of 67.6°F, on April 29.

During the study, the shelter area dry bulb temperature was lower than the outside dry bulb temperature during the daylight hours and greater than the outside dry bulb temperature during the nighttime hours. The THI also followed this trend each day.

### B. Noise and Lighting

During the study, the overall mean noise level for daylight hours (recorded on the General Radio Company Type 1565-A sound-level meter) was 72.1 decibels, with a maximum of 78.8 decibels on May 1, and a minimum of 64 decibels on April 30. These readings were taken with a weighting characteristic of A which discriminates heavily against low-frequency sounds and therefore gives an indication closely correlated with subjective estimates of loudness, annoyance, and speech interference.

The noise levels of several familiar sounds are: normal conversation - 60 decibels; quiet office - 40 decibels; noisy auto - 80 decibels; painful sound - 130 decibels. The overall mean noise level of 72.1 decibels was within the range of normal conversation to a noisy auto.

Table 22

Reasons Given by Defectors for Early Exit  
(ES IX)

Reason <sup>a</sup>	Frequency
To accompany parents	6
Too crowded	4
Irritable (child)	3
Families being separated	3
Personality clash with administration	3
Being moved around	3
Anxiety	3
Lack of sleep	3
Headache	2
To accompany spouse	1
Felt conditions had been misrepresented	1
Didn't like shelter	1
Crying child disturbing	1
To study for school test	1
Couldn't change clothes	1
Thought only married couples would be present	1

<sup>a</sup>There were 22 defections. One defector could have several of the reasons listed in this table.

During the study, the overall mean illumination for daylight hours (recorded on the Weston Model 759 foot-lambert meter) was 4.9 foot-lamberts, with a maximum of 13.5 foot-lamberts on April 29, and a minimum of 1.7 foot-lamberts on April 30.

### C. Shelter Supplies

#### 1. Inventory of Shelter Supplies

An inventory of expended shelter supplies is presented in Tables 23 and 24. The list of supplementary medical kit provisions is described elsewhere in this report.

#### 2. Sanitation Kit IV

Three OCD sanitation kits (SK IV) were stocked in the shelter for ES IX.

In the initial setting up of two sanitation kits, the Director of Supply and Maintenance and his assistants separated one double-liner polyethylene bag producing two single-liner bags, one for each fiber drum, thus making each liner more vulnerable to puncture. This was their innovation in the use of the liner assembly. Some shelterees did not heed the Handbook instructions, posted in both commode areas, which cautioned them against throwing sharp objects into the commodes. Therefore, leakage of the polyethylene liners punctured by sharp objects (such as pull rings from snap-top beverage cans which had been discarded in the commodes) became the primary problem pertaining to the sanitation kits. In one instance, a lighted cigarette had been thrown into the commode, which burned a small hole through the inside liner of the polyethylene bag.

Toilet tissue was used excessively. Almost one-third of the two-week supply was used in two days.

#### 3. Medical Kit C

See discussion of the medical kit elsewhere in this report.

#### 4. Food and Water

The shelterees consumed an average of .14 lbs. crackers/person/day and .14 lbs. carbohydrate supplement/person/day (see Table 25). Shelterees were allowed to bring food adjuncts into the shelter, and for this reason, it is impossible to compute the caloric intake.

The shelterees consumed the stocked water supply at an average rate of 2.1 qts./person/day, however, approximately 1½ drums (or approximately 105 quarts) were used for bathing purposes.

Table 23  
OCD Shelter Provisions  
(ES IX)

Item*	Stocked	Used	Unused
Crackers (2 tins/box; 14.5 lbs./tin)			
boxes	18	1.5	16.5
lbs.	522	43.5	478.5
Carbohydrate Supplement (2 tins/box; 35 lbs./tin)			
boxes	4	0.6	3.4
lbs.	280	42.0	238.0
Water (17.5 gals./drum)			
drums	30	9.0	21.0
gals.	525	157.5	367.5
Radiological Kit	1	1	0
Extra Radiological Meters	1	1	0
Sanitation Kit IV	3	3	0
Toilet Tissue (10 rolls ea.)	30	9	21
Drum, fiber (1 ea.)	3	3	0
Commode seat (1 ea.)	3	3	0
Can Opener (1 ea.)	3	2	1
Sanitary Napkins (60 ea.)	180	44	136
Gloves, polyethylene (1 pair ea.)	3	2	1
Spout (siphon hose) 5 ft. $\frac{1}{2}$ in. (1 ea.)	3	3	0
Tie Wire (1 ea.)	3	3	0
Cups, paper (70 ea.)	210	171	39
Cup Lids, plastic (70 ea.)	210	54	156
Bag, polyethylene (1 ea.)	3	3	0
Commode chemical, granular form, 12s (1 ea.)	36	9	27
Instruction Sheet (1 ea.)	3	3	0
Additional Supplies:			
Fire extinguishers	2	0	2
Bible	1	1	0
Mops	1	1	0
Brooms	1	1	0
Shelter Management Handbook	1	1	0

\*OCD Medical Kit and supplementary items are presented in other tables.



Table 24  
Medical Kit Provisions  
(ES IX)

Item	Stocked	Used	Unused
Applicator, wood, cotton tipped end $\frac{1}{2}$ " x 6"/100s	600 applicators	6	594
Aspirin 5 gr/1000s	3000 tabs.	115	2885
Bandage, gauze 2" x 6 yds./12s	6 boxes	0	6
Bandage, muslin, compressed, camouflaged 37" x 37" x 52"	6 units	0	6
Cascara Sagrada Extract 4 gr/100s	600 tabs.	0	600
Cotton, purified 1 lb.	3 lbs.	0	3
Depressor, tongue, wood 100s	300 depressors	3	297
Eugenol 1 oz.	1 btl.	0	1
Eye, nosedrops $\frac{1}{2}$ oz.	18 pkgs.	0.1	17.9
Forceps, dressing $3\frac{1}{2}$ "	1	0	1
Isopropyl Alcohol	6 cans	0.2	5.8
Kaolin and Pectin Mixture 1 pt.	16 btls.	0	16
Pads, gauze 4" x 4"/200s	1200 pads	7	1193
Penicillin G Tablets, 250,000 Units/100s	1200 tabs.	0	1200
Petrolatum, white 1 lb.	3 lbs.	0	3
Phenobarbital Tablets $\frac{1}{2}$ gr/1000s	3000 tabs.	3	2997
Pin, safety $1\frac{1}{2}$ "/12s	12 pkgs.	0	12
Publication: Medical Care in Shelters	1	0	1
Scissors	3	1	2
Soap, surgical $1\frac{1}{2}$ oz.	36 cakes	2	34
Sodium, bicarbonate 1 lb.	2 lbs.	0.1	1.9
Sodium, chloride 1 lb.	2 lbs.	0	2
Sulfadiazine Tablets $7\frac{1}{2}$ gr/1000s	3000 tabs.	0	3000
Syringe, fountain	1	0	1
Thermometer, clinical, human, oral or rectal	4	0	4
Water Purification Tablets, iodine 8 mg.	12 btls.	6	6

Table 25

Average Food and Water Consumption of OCD Stocks  
(ES IX)

Item	Consumed	Consumed/ Person/Day*
Crackers	43.5 pounds	.14 pounds 294.1 calories
Carbohydrate Supplement	42.0 pounds	.14 pounds 266.0 calories
Water	630.0 quarts	2.1 quarts

\*Shelterees were permitted to bring personal food supplies. Consequently, total caloric intake is unknown. Data here are approximate, in view of continuous defections.

## 5. CDR Supplies

The mop and broom provided by CDR were used for sanitation purposes. The CDV-715 radiological meter was used in the EOC program and no malfunctions were noted.

## 6. Shelterees Personal Supplies

Information from the Possessions Inquiry can be interpreted in terms of (1) the number of people bringing an item, and (2) the total number of items brought. For example, if John Doe reported three red belts, this data was recorded as one person with belts, and also as a total of three belts. Items were reported in the usual manner of the packaging of that product, i.e., five packs of cigarettes, not one hundred cigarettes.

In terms of total items, candy, fruit, books, cans of food, and drinking cups were the five most listed. In terms of the number of people who brought a specific item, a comb or brush, blanket or quilt, books, pen or pencils, and candy were the five highest items (see Table 26). In general, persons who defected brought fewer items than those who remained. Even though shelterees were asked to restrict their supplies to those necessary for survival, it is apparent that they interpreted the term "survival" quite freely.

Table 26

Shelteree Personal Possessions  
(ES IX)

Item Brought By At Least 10% of the Shelterees	Number of Shelterees Bringing Item	Percent of Shelterees Bringing Item
Comb or brush	92	62.6
Blanket or quilt	81	55.1
Book (for reading)	71	48.3
Pen and/or pencil	67	45.6
Candy	66	44.9
Deck of cards	61	41.5
Cookies	60	40.8
Pack of gum	58	39.5
Pillow	58	39.5
Watch	50	34.0
Wet-dry towelettes	47	32.0
Food in cans	45	30.6
Fruit	43	29.3
Writing paper	42	28.6
Sweater	35	23.8
Toothbrush	34	23.1
Games	33	22.4
Pack of Cigarettes	32	21.8
Matches or lighter	32	21.8
Cosmetics	32	21.8
Radio	31	21.1
Magazine	30	20.4
Drinking cup or glass	29	19.7
Deodorant	29	19.7
Sheet or bedspread	28	19.0
Men's underwear	28	19.0
Shirt	28	19.0
Headache preparation	25	17.0
Pants	24	16.3
Suitcase	24	16.3
Men's socks	23	15.6
Jacket	22	15.0
Knife	22	15.0
Sleeping bag	21	14.3
Air mattress	21	14.3
Blouse	21	14.3
Women's underwear	21	14.3
Canned fruit juice	21	14.3
Water	20	13.6
Mirror	20	13.6
Children's color book	18	12.2
Toothpaste	17	11.6
Facial tissue	16	10.9
Nail clipper and/or file	14	9.5
Individual prescription	14	9.5

### Part Three - Conclusions

#### I. Space Utilization

- A. Shift-sleeping did not appear feasible in a one-room shelter, but may be useful in a multi-room situation.
- B. Under the conditions tested, 7.0 sq. ft./shelter occupant appeared to be the minimal advisable.
- C. Exclusion of personal possessions, if decided upon by management, should be enforced on an equitable basis. Partial compliance induces a morale problem.

#### II. Civil Defense Preparedness

As in previous studies, most shelterees were found to be unprepared for a nuclear emergency.

#### III. Emergent Leadership Prediction

- A. Both temporary and permanent shelter staffs scored significantly higher on the MMPI Leadership Sub Scale than did the remaining shelter population.
- B. Some questions, e.g., "Are you a high school graduate?", discriminated significantly between staff and non-staff shelterees.

#### IV. Shelter Management

- A. The triumvirate temporary shelter manager system functioned smoothly in the temporary phase.
- B. The temporary and permanent staff structures were adequate under the conditions tested.

#### V. In-Shelter Program

- A. Under the test conditions, shelterees preferred simultaneous sleeping over shift-sleeping.
- B. Family groups resented separation during the shift-sleeping plan.

- C. Nursery groups structured along age lines appear preferable to one single group.
- D. The greatest medical complaint was headache.
- E. Physician evaluation of Medical Kit C should be further tested.

#### VI. Shelteree Reactions

- A. Negative diary comments centered on space and fatigue. Low ebb of the study occurred Saturday morning.
- B. Shelteree estimates of tolerance for continued confinement were: total group mean 5.8 days, median 3.5 days; male mean 6.2 days, median 5.5 days; female mean 5.5 days, median 2.5 days.
- C. When asked to list three items considered desirable for a shelter stay, the top three mentioned by occupants were bedding, food, and recreational items.
- D. Primary discomfort factors were poor sleep conditions, no bathing, and space.

#### VII. Defections

- A. Twenty-two shelterees defected prior to study completion.
- B. In-shelter physicians did not ascribe defections to medical factors.

#### VIII. Environmental Variables

- A. Average shelter Temperature-Humidity Index was 69.8°F, with maximum index of 71.8°F, and minimum index of 67.6°F.
- B. Mean shelter day noise level was 72.1 decibels, with maximum level of 78.8 decibels and minimum level of 64.0 decibels.
- C. Mean shelter day lighting level was 4.9 foot-lamberts, with maximum level of 13.5 foot-lamberts, and minimum level of 1.7 foot-lamberts.

#### IX. Shelter Supplies

- A. At the rate of consumption (2.1 qts./person/day) the standard water supply would not have been sufficient for a two-week period, even though shelterees brought additional water with them.
- B. At the rate of use (almost one-third used), the standard toilet tissue supply would have been insufficient for a two-week stay.

## Chapter 3 - Experimental Study X

### Part One - Experimental Design

#### I. Purpose

The primary purposes of ES X (implemented 22-24 July, 1966) were to test (a) management organization for a 500-person shelter, (b) a shelter handbook for untrained management of a 500-person shelter, (c) effects of reduced space allotment on such management, and (d) continued assessment of OCD stocks.

#### II. Shelteree Characteristics

- A. Number: Five hundred, to include three medics and two inside CDR observers. Other CDR personnel were additional.
- B. Age: 1-70 years.
- C. Sex: Approximately evenly divided.
- D. Race: Approximated 1960 U.S. Census figures.
- E. Pay: \$25, ages 1 through 19; \$35, ages 20 through 39; \$45, ages 40 and above.

Instructions prior to arrival: (a) conditions will be crowded; (b) bring only one large grocery bag (two bags for infant permissible) with such items as food that will not spoil, blanket, flashlight, and anything else that will fit in the bag; (c) OCD stocks will be provided; (d) no pets allowed; (e) no cameras allowed; (f) no note-taking permitted during the study; (g) study will be integrated; (h) time and place to report, and time and place of release.

#### III. Pre-Shelter Processing

Shelterees were processed at the Coliseum and brought by busses to the Costa Building.

A pre-shelter address included instructions that shelterees manage the shelter themselves with the aid of a handbook stocked with shelter supplies.



#### IV. Shelter Management

- A. Staff: Shelterees managed the shelter themselves.
- B. Shelter entrance: Shelterees were phased into the shelter as they arrived at the Costa Building from the pre-processing area.
- C. Space utilization plans: Based on ES IX results, plans were incorporated in the Handbook.
- D. Handbook: Revised on basis of ES IX results.
- E. EOC: An EOC format was programmed.

#### V. Shelter Environment

- A. Shelter: First and second floors of the Costa Building.
- B. Space: Approximately 8.0 sq. ft./person, including storage.
- C. Ventilation: Natural and PVK, plus window fans as necessary.
- D. Supplies: (a) Handbook, (b) shelteree personal possessions, (c) OCD stocks of food, water, Sanitation Kit IV, and Radiological Kit, (d) Medical Kit with CDR supplements, (e) one broom, one mop, (f) two PVKs, and (g) experimental commode chemical.

## Part Two - Results

### I. Shelteree Characteristics and Occupational Backgrounds

Shelteree characteristics are presented in Table 27.

The age range, from nine months through seventy-three years, was the largest for CDR occupancy tests to date. As an aid to recruitment, a contest was held and a cash prize awarded to the former adult shelteree who obtained the largest number of applicants ultimately chosen for study participation. Two hundred and twenty-two of the five hundred and four shelterees were recruited through this contest.

The occupations of the shelterees ranged from professional to unskilled. A breakdown of occupational categories with number and percentage of shelterees falling within a particular category is presented in Table 28.



Table 27

Shelteree Characteristics  
(ES X)

Item	U.S. Census (1960)	ES X
Number of Shelterees		504
Age Range		9 months-73 years
Average Age	29.5 years (median)	20 years (median) 23.0 years (mean)
Average Education*	10.6 years (median)	12 years (median) 11.6 years (mean)
Sex	49.3% males 50.7% females	41.3% males 58.7% females
Race	88.6% white 10.5% Negro 0.9% other	87.1% white 12.9% Negro

\*Computed for shelterees 25 years of age and older.

Table 28

Shelteree Occupational Background  
(ES X)

Occupational Category	Number	Percent
Professional and Managerial (including military)	37	7.3
Clerical and Sales	27	5.4
Service	26	5.2
Agricultural, Fishery, Forestry	2	0.4
Skilled	17	3.4
Semi-skilled	23	4.6
Unskilled	7	1.4
Housewife	78	15.5
Student	216	42.9
Pre-school	62	12.3
Unemployed and Retired	6	1.2
Information not available	3	0.6

## II. Pre-Shelter Processing

### A. Medical Coverage on Day of Entry

Upon arrival each shelteree was required to complete a medical questionnaire. Any shelteree who listed a condition which could be contagious to other shelterees, or which might be complicated by the shelter stay, was referred to a physician for further evaluation. This was designated a "non-routine" referral. All shelterees fifty years of age or older were referred to a physician for a check up, and such instances were designated "routine" referrals. There were twenty-three routine referrals and sixty-seven non-routine referrals. "On medication" accounted for most non-routine referrals (see Table 29). Of non-routine referrals females accounted for forty-five while males accounted for only twenty-two. The age group of zero to nine accounted for more non-routine referrals (22) than any other. Although there were a number of referrals in most age groups, no one was rejected for medical reasons on the day of entry.

### B. Civil Defense Preparedness

Prior to shelter entry, two hundred and eighty-five shelterees over fourteen years of age completed the Pre-Shelter Questionnaire. Items pertained to civil defense preparedness, knowledge concerning civil defense warning devices and communications system, and previous civil defense training. Items thirty-seven to forty on the Pre-Shelter Questionnaire were adapted from the Civil Defense Preparedness Questionnaire prepared by the American Institutes for Research.

Responses to questionnaire items indicated that in general the shelterees were unprepared for home emergencies, but were familiar with fallout shelter designations, the civil defense communications system, and civil defense warning devices. Most of the shelterees had not attended civil defense classes. See Table 30.

### C. Leadership Prediction

As in ES IX, the Pre-Shelter Questionnaire item, "Are you a high school graduate?", differentiated the permanent staff from the remaining population in both ES IX and ES X (see Table 31). This was the result of staff selection on the basis of Information Cards. The item, "Do you feel confident and at ease when leading a group of people?" also differentiated the permanent staff from other shelterees in both ES IX and ES X.

With regard to the Minnesota Multiphasic Personality Inventory (MMPI) Leadership Sub-Scale given to two hundred and eighty-three shelterees over fourteen years of age prior to shelter entry, the

Table 29

Reason for Medical Referral on Day of Entry  
(ES X)

	Age, Sex and Number												Total	
	0-9		10-19		20-29		30-39		40-49		50-59		60+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Routine	0	0	0	0	0	0	0	0	0	0	4	9	3	8
Non-routine	0	1	2	3	1	1	1	4	0	4	0	0	0	0
On medication	1	4	5	2	3	5	0	0	0	0	0	0	0	0
Earache	4	1	5	2	0	2	1	0	1	1	0	0	0	0
Cold	1	3	4	1	1	2	0	1	0	0	0	0	0	0
Sore throat	0	2	2	0	2	2	0	0	0	0	0	0	0	0
Allergy	1	0	1	0	0	0	0	1	0	0	0	0	0	0
Asthma	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Hay fever	0	2	2	0	0	0	0	0	0	0	0	0	0	0
Toothache	0	2	2	0	0	0	0	0	0	0	0	0	0	0
Vesicles in mouth	0	2	2	0	0	0	0	0	0	0	0	0	0	0
Disability	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Hernia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cystitis	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Poor eyesight	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pregnant	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Fungal infection	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Dizziness during period	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Kidney ailment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown*	0	0	0	0	1	1	0	0	0	0	0	0	0	0

\*Physician failed to record reason for referral of one 17-year-old female.

Table 30

Shelteree Indication of Civil Defense Preparedness  
(ES X)

Question	Response		Total
	Yes	No	
Do you have a family fallout shelter?	4 (1.4%)	281 (98.5%)	285
In case of an emergency, do you know where there is a community fallout shelter where you and your family could go for protection?	184 (64.5%)	101 (35.4%)	285
Do you have emergency supplies of food and water in your home?	47 (17.8%)	217 (82.1%)	264
Do you have emergency supplies of medicine and first aid equipment in your home?	113 (39.6%)	172 (60.3%)	285
Have you gone to civil defense classes?:	36 (12.5%)	252 (87.5%)	288
a) Radiological Monitoring	9 (3.2%)	266 (96.7%)	275
b) Radiological Defense Officer	7 (2.5%)	271 (97.4%)	278
c) Shelter Management for Instructors	3 (1.0%)	274 (98.9%)	277
d) Civil Defense Management	8 (2.8%)	270 (97.1%)	278
e) Other	29 (10.4%)	249 (89.5%)	278
Do you know what outdoor warning device will be used to alert this community in the event of nuclear attack?	150 (53.0%)	133 (46.9%)	283
The outdoor warning device used to alert this community in the event of a nuclear attack sounds like			
a) Bell	4 (1.5%)		
b) Horn	31 (11.7%)		
c) Siren	222 (84.1%)		
d) Whistle	7 (2.6%)		
Do you know how to identify a public fallout shelter?	225 (80.3%)	55 (19.6%)	280
Do you know of a communications system through which the public could receive emergency instructions?	220 (77.7%)	63 (22.2%)	283
The communications system through which the public could receive emergency instruction is:			
a) Telephone	8 (2.9%)		8
b) Newspaper	7 (2.5%)		7
c) Skywriters	0 (0 )		0
d) Emergency Broadcasting System	261 (94.6%)		261

Table 31  
Comparison of Permanent Staff with Other Shelteree  
Responses on Certain Pre-Processing Questions  
(ES X)

Question	N	Group	Response		Chi Square	p
			Yes	No		
Are you a high school graduate?	20 270	Permanent staff Other shelterees	19 152	1 118	11.73	.001
Do you feel confident and at ease when leading a group of people?	20 263	Permanent staff Other shelterees	18 146	2 117	9.06	.005



permanent shelter staff scored significantly higher than the temporary staff ( $P=.025$ ), and also higher than the remaining population ( $P<.005$ ). Test scores of the temporary shelter staff were not significantly different from the remaining population. Furthermore, of the temporary staff, only 15.4% fell in the upper quarter of the total test score distribution, while of the permanent staff, 38.4% fell in the upper quarter of all test scores.

In ES X there was also a statistically significant difference between the MMPI Leadership Sub-Scale scores of the temporary and permanent staffs, whereas this difference was absent in ES IX. One possible explanation is that in ES IX many temporary staff members also served as permanent staff members where in ES X this was not the case. Another is that volunteers were obtained in ES IX for temporary staff positions, whereas in ES X, members of the temporary staff were appointed randomly. In light of other differences discussed in the management section of this report it would appear that had Handbook instructions been followed in ES X in the selection of the temporary staff, differences between temporary and permanent staffs may not have been as pronounced.

### III. Shelter Management Organization

#### A. Chronology of Events

##### Friday, 22 July, Temporary Phase to 11:00 P.M.

Shelter entry occurred at 5:40 P.M. A group soon congregated around the Handbook. A young man finally took the Handbook from its place and began to distribute the temporary staff leaflets without reading the announcement on the Handbook cover. By 5:44 P.M. all leaflets had been distributed and most were being read. At 5:45 P.M. Information Cards were being passed out by Temporary Shelter Manager B and her assistants. The incoming shelterees stayed downstairs in the large room with only a few shelterees going upstairs. The staff finished initial instructions and started to disperse.

At 5:53 P.M. Temporary Shelter Manager B made her speech, followed by the Temporary Medical Officer asking for someone with medical experience. The temporary staff was functioning now except for the Temporary Security Officer. The medical area sign was posted, supplies were being moved, Temporary Ventilation Officer and Temporary Radiological Officers 1 and 2 had found their instruments and had begun to follow instructions by 6:00 P.M. Temporary Shelter Manager A began reading his instructions for permanent staff selection. Temporary Shelter Manager B was collecting Information Cards and Temporary Shelter Manager C was assisting other temporary staff members. At 6:00 P.M. Temporary Shelter Manager B began Information Card-sorting operations. The first sanitation kit was moved to the commode area.



At about 6:05 P.M. the Temporary Water Supply Officer obtained the water purification tablets from the medical kit. The first commode was set up at 6:10 P.M. downstairs and was designated for use by both sexes.

All the shelterees were called into the main room downstairs at 6:22 P.M. by Temporary Shelter Manager B in order to check that everyone had filled out an Information Card. The Temporary Security Officer had not functioned, and no one seemed to know who had received this leaflet. Temporary Shelter Managers A and B were assisting and supervising other temporary staff members but had not yet begun the selection of the permanent staff.

The Radiological Officers were functioning well; outside monitoring was conducted until a reading of .5r./hr. was reported to Radiological Officer 1. During this time Radiological Officer 2 was using the CDV-715 meter with head phones to check shelterees for fallout contamination.

At 6:20 P.M. Temporary Shelter Manager C incorrectly opened the permanent phase section of the Handbook, ignoring instructions given in both his leaflet and in the Handbook box. After looking over the permanent staff instruction leaflets, he began to pass them out randomly, asking people to accept them.

Temporary Shelter Manager B selected two assistants to sort Information Cards while she continued to collect the cards and to instruct people to fill them out. The crowded conditions of the main room made supply movement almost impossible, causing quite a bit of grumbling among shelterees and preventing good staff communication. Temperature and humidity were rising.

The Temporary Communications Officer finally reached EOC after some difficulty with the shelter phone operation. Electrical operation of the Packaged Ventilation Kit began downstairs at 6:55 P.M., with utilization of duct work. Up to this time it had been run as a fan, without duct work.

Several temporary staff members, who were incorrectly given permanent leaflets, discarded their temporary instructions and began to perform permanent tasks. Among them were the Temporary Medical Officer who received the Head of Shelter Medical Team leaflet, the Temporary Food Supply Officer who was completing inventory and figuring daily rations with the Director of Operations' instructions, Temporary Shelter Manager C who read Shelter Manager and Assistant Shelter Manager leaflets, and Temporary Radiological Officer 1 who was attempting to follow instructions for the Director of Radiological Monitoring and Communications. These persons became quite confused, since these instructions were programmed for permanent phase and referred to positions not yet filled.

At 7:05 P.M. the Information Cards were still being turned in. At 7:10 P.M. Temporary Shelter Manager B noticed that one shelteree was the Civil Defense Director of a near-by county and appointed him Shelter Manager. (He had been appointed director only a few weeks prior to the study and as yet had little experience in Civil Defense.)

The Permanent Shelter Manager received the Handbook box from Temporary Shelter Manager B at 7:12 P.M. Temporary Shelter Manager B explained the functioning of the temporary staff up to this time and informed the Shelter Manager that some of the temporary staff had been using permanent staff instruction leaflets. Temporary Shelter Manager A continued to select the permanent staff from cards. The Shelter Manager began to select Section Leaders, choosing one for each room.

At 7:40 P.M. the temporary staff held a meeting to ask the Permanent Shelter Manager to complete formation of his staff. The Permanent Shelter Manager, however, asked the temporary staff to continue in the selection of permanent staff members.

At 7:41 P.M. the Temporary Water Supply Officer began distribution. The Temporary Ventilation Officer and his assistants were setting the Packaged Ventilation Kit on water drums to keep the moving blades out of the reach of children and also to help straighten duct work.

The first Assistant Shelter Manager defected at 7:52 P.M. and a new Assistant Shelter Manager was chosen immediately.

At about 8:00 P.M. the Shelter Manager with the Temporary Ventilation Officer decided to place the Packaged Ventilation Kit on the low ceiling of the commode area to increase floor space and to vent off hot air at the ceiling.

At 8:10 P.M. the Director of Operations defected giving his instruction leaflet to the Temporary Food Supply Officer; consequently, the new Director of Operations had no instructions. Temporary Radiological Officer 1 was looking for the Director of Radiological Monitoring and Communications to give him the permanent phase leaflet.

The first problem between shelterees occurred in Room B when one woman spilled water accidentally on another. The second woman spoke rudely to the first.

Empty water drums were being moved to the ceiling of the commode area. The first OCD food rations were dispensed at 8:30 P.M. Ration amounts were determined by the Temporary Food Supply Officer's calculations made from the Director of Operation's instructions. At 8:37 P.M. the second Assistant Shelter Manager defected. No attempt was made to replace him immediately. The Shelter Manager had little time to read his instructions and was using his own judgment to solve problems and to organize the shelter. Most of the temporary staff was still functioning.



A physician and one nurse were located about 8:45 P.M. The physician went through the medical kit and the nurse posted the medical area sign. Then the physician abandoned the kit to organize Room A and to help implement sleeping arrangements. These activities, however, were not included in his instructions. The Director of Operations was meanwhile arranging shelterees for sleeping in the other downstairs rooms.

The Director of Training and the Director of Radiological Monitoring and Communications were selected by Temporary Shelter Manager B at 8:56 P.M. After reading his instructions, the

Director of Radiological Monitoring and Communications appointed the Temporary Communications Officer as a communications watchstander, and strapping on the CDV-715 meter, began taking readings in all parts of the shelter.

At 9:00 P.M. there took place the first permanent staff meeting, attended also by the temporary staff. This point of time is considered to mark the end of the temporary phase, which lasted about three hours and twenty minutes. Duties of the permanent staff were read. Temporary Shelter Manager B asked if the temporary staff could now be relieved. Her assistance was asked in appointing more Section Leaders and in replacing staff members. The meeting was over at 9:15 P.M. The Shelter Manager announced that for equitable distribution, thirty people were needed upstairs. Figures were based primarily on observations by the Shelter Manager and directors.

At 9:42 P.M. the Administrative Clerk defected and no immediate replacement was made. At 10:00 P.M. the Shelter Manager, on being told that the Assistant Shelter Manager had defected, appointed a Section Leader to be Assistant Shelter Manager. The permanent staff directors were using Information Cards to select their assistants. The shelter began to become quiet for sleeping.

Friday, 22 July, 11:00 P.M. to Saturday, 23 July, 5:00 A.M.

By 11:00 P.M. the two upstairs rooms had begun to settle down for sleep. Although there was one Section Leader and one assistant, no attempt was made to implement any space utilization plan.

Lights were turned out in Room E at 11:28 P.M., then in Room D at 11:35 P.M., and noise abated. "Lights out" was announced at 11:55 P.M. by the Shelter Manager downstairs and they were off by 12:05 A.M. in Room C. Rooms A and B remained lit until 12:30 A.M. At 3:00 A.M. communications and radiological watch standers changed shift.

Saturday, 23 July, 5:00 A.M. to 11:00 P.M.

The shelterees began waking upstairs at about 5:10 A.M., where there was more natural light, and at about 5:45 A.M. downstairs. "Lights on" was announced downstairs by the Shelter Manager, and at 6:30 A.M. food and water was distributed.

By 7:00 A.M. most of the shelterees were eating. Many of the shelterees upstairs ate their own food. A centralized feeding method was used whereby each section obtained their

rations at a centrally located area. The Section Leader on the second floor followed approximately the same feeding schedule as the Director of Operations on the first floor. At 7:15 A.M. a Section Leader's Map Form was posted by the Section Leader on the second floor; however, it listed only the ration schedule. By 7:25 A.M. all rations were distributed on both floors. During this time, the Shelter Manager was searching through the Information Cards to find qualified people to fill the Assistant Shelter Manager, Administrative Clerk, and Director of Training positions which had been vacated by defectors. At 7:00 A.M. the Director of Training was functioning, at 7:30 A.M. the Assistant Shelter Manager was chosen and by 7:45 A.M. the Administrative Clerk had begun reading her instructions. At 7:35 A.M. a Section Leader for Room D was appointed by the Director of Supply and Maintenance.

Between 7:50 A.M. and 8:15 A.M. roll was taken of shelterees in Room D, OCD supplies inventoried by the Section Leader in Room E, and commode watches assigned on the first floor. Sweeping continued in Room A, and an empty water drum was used to store trash. Also during this time a Shelter Manager announcement was made to shelterees in Room B that they would have to evacuate the room, due to the number of defections that had occurred. (This change was necessary in order to keep experimental space allotment per person constant throughout the study.) In an attempt to find a way to persuade the shelterees to move, the Shelter Manager called a staff meeting to be held at 8:30 A.M. The staff meeting was held on the stairwell at the time designated by the Shelter Manager. When the Shelter Manager asked for suggestions, the physician immediately protested the move and asked the Section Leaders to calculate the amount of space each shelteree had, and if they found that each person had less than 8 sq. ft./person, it should be brought to the attention of the experimenters. (In this matter the physician overstepped his assigned duties.) At 8:45 A.M. the meeting adjourned and each Section Leader returned to his section to measure the amount of space occupied by his group.

At 8:50 A.M. announcements were made by several Section Leaders to their sections concerning head count, food and water allotment, and problems of space utilization. Room A voted on how they wanted their space utilized. Between 8:50 A.M. and 9:15 A.M. commode watches were assigned on the second floor and a survey made of the space allotment of Room D by the Assistant Shelter Manager in an attempt to find space for the shelterees in Room B.

At 9:20 A.M. the Director of Supply and Maintenance appointed two persons for Head of Fire Control Team, one for each floor, and at 9:20 A.M. the Director of Training was appointed

by the Director of Operations. At 9:25 A.M. the physician spoke to shelterees on both floors, asking them not to defect, as additional rooms would then have to be closed. He also told them of the availability of medicines. After his announcement, several shelterees followed him to the medical area to obtain aspirin and sleeping pills.

A meeting with Section Leaders was again called by the Shelter Manager at 9:30 A.M. Several Section Leaders announced they had less than 8 sq. ft./person. A shadow staff member informed the shelter staff members that they did have on the average of 8 sq. ft./person; this figure had been checked many times by the CDR staff. The Section Leaders then admitted that their calculations were crude and an error could have easily been made.

For the next forty-five minutes shelterees and staff members were busy filling out diaries and attempting to find more space. Sleeping arrangements were being planned and supplies rearranged in Rooms A and C. Blankets were still spread over the floors, leaving no aisle space. Eighteen shelterees from Room B moved upstairs, with one family still refusing to leave.

Community singing began at 10:20 A.M. in Room C and at 10:30 A.M. the Assistant Shelter Manager and the Section Leaders were still trying to find space for the remaining shelterees from Room B. The Shelter Manager ordered air mattresses deflated and sections tightened up. From 10:30 A.M. to 11:00 A.M., group singing was conducted by the Section Leader in Room A. Apparently no organized activity took place in the other rooms. During this time, the Director of Training defected and the Director of Operations took over the job without attempting to find a replacement.

Food and water distribution took place at 11:00 A.M. on both floors. Everyone had eaten by 11:30 A.M. The Section Leader in Room A gave a "pep talk" to her section concerning the advantages of completing their shelter stay. She also told the group that if anyone defected, the room would be closed. A second Section Leader was appointed for Room D.

Up to this time, because of the confusion and a lack of cooperation among the shelterees and staff members, all the shelterees in Room B had not been moved out as experimentally required. Therefore, the CDR Project Director met with the shelter staff and expressed the confidence he had in them to organize and operate the shelter efficiently and to solve this particular problem. He offered no suggestions on how the staff was to resolve space problems, but indicated that answers could

be found in the Handbook. Immediately following the Project Director's talk, the staff met and formulated plans.

At 11:50 A.M. the Section Leaders from Rooms A, D, and E announced to their groups that all air mattresses must be deflated and aisles made. The Shelter Manager made the same announcement in Room C. An appeal for cooperation was also made, and room for the last of the shelterees of Room B was consequently provided.

Between 12:25 P.M. and 12:45 P.M. the Packaged Ventilation Kits were being prepared for manual operation. A Section Leader on the first floor announced the probability of a blackout and asked everyone to remain calm. Activity appeared to increase at this time. A lecture on fallout was given in Room D by the Director of Training.

Water distribution began at 1:10 P.M. on the second floor, while a short exercise period was conducted on the first floor. Another lecture began at 1:10 P.M. in Room A by the Director of Training and continued until 1:25 P.M. At 1:30 P.M. a child cut her foot on a food tin brought in by a shelteree, and was accompanied to a hospital by the physician, both returning later.

At 1:35 P.M. the lecture on fallout was delivered in Room E, while an announcement about picking up trash was being made on the first floor by the Director of Supply and Maintenance. Following this announcement, singing entertainment was provided by four persons.

An experimentally programmed power failure occurred on the first floor at 2:25 P.M. to encourage manual operation of the PVKs. The Packaged Ventilation Kit was moved off the ceiling of the commode area and at 2:30 P.M. manual operation began. Water was given out at this time on the first floor. Fifteen minutes later a similar power failure occurred on the second floor, and manual operation of the second floor Packaged Ventilation Kit began at 3:20 P.M.

At 3:40 P.M. water was given out on the second floor and at 4:30 P.M. rations were distributed on both floors. Between 5:00 P.M. and 6:00 P.M. the second floor had a general cleanup period and some exercising was conducted on the first floor. At 6:25 P.M. the upstairs lights were turned on. At that time the Section Leader in Room D announced to his group that extra rations would be distributed at 8:30 P.M. He also asked for suggestions on how to rearrange sleeping positions to provide for more aisle space.



In Room D water was distributed followed by group singing in Rooms D and E. At 7:15 P.M. water call was given on the first floor. From 7:30 P.M. to 8:15 P.M. several shelterees were brought to the medical area. One girl had fainted and another was treated for a cigarette burn.

Diaries were given out to shelterees at 8:15 P.M. Rations were distributed at 8:40 P.M. in Room D. The Section Leader of that room announced a tentative lights-out at 10:00 P.M. The Section Leader in Room A asked that all personal possession paper bags be placed on top of the OCD supplies to provide more space for sleeping.

At 8:40 P.M. a man was brought to the medical area overcome with the heat, and a girl was treated for a toothache. A wash area was set up for food and water dispensers to cleanse their hands. At 8:50 P.M. the physician emptied the water as the traffic caused too much congestion in the medical area.

An announcement was made by the Shelter Manager at 8:55 P.M. concerning sleeping arrangements, and by 9:25 P.M. everyone in Room C was quiet and ready for sleeping. At 9:40 P.M. a last call was given for water in Room D, and at 9:45 P.M. Room E was distributing water. At 10:00 P.M. the Section Leader called for lights out in both rooms.

Lights in Room C were turned out immediately following an announcement by the physician. He told the shelterees there would be no smoking except on the steps, cautioned them about throwing cans on the floor, and asked for cooperation in maintaining good sanitation.

Saturday, 23 July, 11:00 P.M. to Sunday, 24 July, 7:00 A.M.

The Director of Supply and Maintenance and the Shelter Manager made the decision not to operate the Packaged Ventilation Kit at night since the shelter had been cool and the noise had kept some shelterees from sleeping the previous night. Space utilization was better, due to better storage of supplies, somewhat more organized sleeping, and maintenance of aisles. The shelterees seemed to be quieter than they had been the previous night. At 3:20 A.M. the physician was called upstairs to attend a child.

Shelterees began to arise at 5:30 A.M. upstairs and about 5:40 A.M. downstairs. Ration distribution appeared to be on an ad lib schedule. Most of the shelterees' personal supplies had been exhausted and OCD supplies were now being used by nearly all shelterees.

Sunday, 24 July, 7 A.M. to Exit

At 7:20 A.M. lights were turned on upstairs. Ration distribution occurred downstairs at 7:45 A.M. At this time the downstairs Packaged Ventilation Kit was again in manual operation. A line of young shelterees formed to take turns on the bicycle apparatus. Commode monitors were placed on duty and communications and radiological monitors also began to function.

A general, spontaneous cleanup was held after ration distribution. After the cleanup, shelterees began to exercise. More shelterees participated in this activity than had previously.

At 8:35 A.M. the Director of Training gave a lecture upstairs with a question-answer period on decontamination procedures, then gave the same lecture downstairs at 9:05 A.M. A woman volunteer was entertaining children by reading stories to them.

At 9:55 A.M. the Assistant Shelter Manager distributed diaries and more Information Cards to be filled out. At 10:30 A.M. devotional services were held upstairs. The non-denominational services included a short sermon, prayer, and hymn. Services lasted ten minutes.

At 10:35 A.M. a water break was called downstairs, during which the Director of Activities announced devotional services to be held in the main room downstairs, with a nursery in Room A. Services started about 11:00 A.M., lasting until 11:30 A.M. There were Bible readings by shelterees and hymns led by a Negro woman. Later a general singing session met with good response.

At 11:30 A.M. the Packaged Ventilation Kit upstairs had a mechanical breakdown--the pedals kept coming off. The Director of Supply and Maintenance repaired the assembly quickly, as he had previously corrected the same problem downstairs.

Shelter-wide ration distribution began at noon. The lights were turned off upstairs for a nap period after feeding and cleanup.

Upstairs, the Director of Training gave a lecture on sanitation at 12:55 P.M. There was poor response, due to the interruption of the nap period. This lecture was given downstairs between 1:45 P.M. and 2:00 P.M.

At 1:45 P.M. an announcement concerning exit was made upstairs. This announcement was given downstairs at 2:00 P.M. Electricity was restored to the Packaged Ventilation Kits at 2:00 P.M. At 2:17 P.M. the Director of Activities asked for names of all shelterees familiar with farm machinery, an EOC programmed request.

General activity in the shelter consisted of packing belongings for exit, cleanup, and distribution of Post-Shelter Questionnaires by Section Leaders. There was ad libitum water and carbohydrate supplement distribution throughout the shelter.

At 4:20 P.M. the Director of Supply and Maintenance evacuated Room A for a medical area check. General movement toward the exit began at 5:00 P.M. Cleanup and packing continued until 5:30 P.M. when the Project Director made the exit announcement.

#### B. Temporary Phase Organization

A young man was first to open the Handbook. He immediately began to distribute leaflets at random, although directions on the front of the Handbook instructed him to make an announcement asking for volunteers to assume staff positions. Previous CDR studies indicated that staff recruitment on a voluntary basis is the more effective procedure in temporary phase organization. Temporary Shelter Manager B and Temporary Shelter Manager C were also chosen in a random manner. Temporary Shelter Manager B then began to choose assistants and distribute Information Cards. In approximately five minutes all leaflets had been distributed by Temporary Shelter Manager A and most were being read. Temporary Radiological Officer 1's leaflet was returned to Temporary Shelter Manager A and he assigned a young girl to this position.

The Temporary Security Officer leaflet was given to a middle-aged female who merely read the heading and then placed it in her handbag. With this exception all Temporary Officers at least attempted to complete their duties. It was later determined that the woman given the Temporary Security Officer leaflet had but four years of formal education. This incident emphasizes the necessity of obtaining voluntary, literate temporary staff rather than selection through arbitrary appointment.

In passing out the Information Cards, Temporary Shelter Manager B misinterpreted the instruction to keep her assistants in the same general area where cards were distributed and instead kept all of the shelterees in one large room (Room C). The resulting overcrowding led to some early defections, difficulty in supply movement, increased congestion around entry ways, and uncomfortable temperature and humidity levels in Room C. Temporary Shelter

Manager B supervised Information Card sorting and informed chosen permanent staff members of their selection. During this time Temporary Shelter Manager A and Temporary Shelter Manager C were supervising other staff members and helping move supplies.

By 6:20 P.M. the Radiological Officers had located their instruments and had begun monitoring duties, the first SK IV had been set up, and the Temporary Water Supply Officer had purified several drums of water. Electrical operation of the PVK followed soon after. The Temporary Medical Officer made an announcement asking for persons with medical experience, but no one responded.

The Temporary Staff was allowed to set up commodes during the temporary phase, but a commode chemical test was programmed for the permanent phase.

PVK operation was confused at first, due to failure to read packaged OCD instructions. Three men, including the Temporary Ventilation Officer, removed the modules from the packing and merely placed the fan assembly on the floor, operating it electrically. Not until 7:00 P.M. was the stand assembled and attached to the fan. Duct work became a problem until the assembly was lifted to the roof covering the commode area about 5 ft. below the ceiling of the room. (For a detailed discussion of the PVK see Environmental Variables.)

At about 6:20 P.M. Temporary Shelter Manager C, ignoring Handbook instructions, incorrectly opened the permanent phase of the Handbook and began to distribute permanent staff leaflets to members of the temporary staff. The Temporary Medical Officer received the Head of Shelter Medical Team leaflet; the Temporary Food Supply Officer received the Director of Operations leaflet, and Temporary Radiological Officer 1 received the Director of Radiological Monitoring and Communications leaflet. This error was compounded when the temporary staff members attempted to fulfill these duties as well as their own. The leaflets referred to positions not yet filled, and since Handbook instructions are of a programmed nature, many duties could not be fulfilled until certain temporary duties had been completed. The error also resulted in certain leaflets being unavailable at a later time when the permanent staff was selected. Characteristics of temporary staff personnel are presented in Table 32.

#### C. Permanent Phase Organization

Temporary Shelter Manager B chose three assistants to distribute Information Cards and collect them. Although overcrowding in the large room caused some confusion in regard to the number of shelterees who had filled out cards, most had done so and returned them before selection of the permanent staff began. Approximately three hundred cards were used in staff selection. Contrary to

Table 32  
Temporary Shelter Staff Characteristics  
(ES X)

Position	Age*Sex	Occupational Background	Education* (Years)	Marital Status	Number of Children in Shelter	Number of Family Members in Shelter
Temporary Shelter Manager A	26 M	Student	18	S	0	0
Temporary Shelter Manager B	23 F	Secretary	12	S	0	3
Temporary Shelter Manager C	20 M	Student	14	S	0	0
Temporary Radiological Officer 1	14 F	Student	9	S	0	0
Temporary Radiological Officer 2	22 F	Student	16	M	0	0
Temporary Security Officer	49 F	Maid	4	M	0	0
Temporary Water Supply Officer	26 F	Teacher	16	M	0	0
Temporary Food Supply Officer	24 M	Student	18	M	0	0
Temporary Medical Officer	20 M	Student	10	S	0	0
Temporary Communications Officer	43 F	Nurses' Aid	12	M	3	3
Temporary Sanitation Officer	21 M	Student	15	M	0	1
Temporary Ventilation Officer	22 M	Student	16	S	0	0

\*Mean age--25.8; age range--14-49; median age--22.5.

'Mean education--13.3; educational range--4-18; median education--14.5.

Handbook instructions, cards, at this time, were given to all ages rather than just to persons over seventeen years of age. The cards returned for persons under seventeen years old therefore slightly delayed staff selection.

Sorting began at approximately 6:15 and cards were in continuous use throughout the evening. For the most part sorting was done by the assistants. Temporary Shelter Manager B followed the qualification chart in her instructions and properly selected staff members. The first problem encountered was the military designation of rank, E-4, E-2, etc. None of the sorters or Temporary Shelter Manager B knew to what rank these designations referred, but the question was soon resolved by a Naval Officer.

Temporary Shelter Manager B was faced with two problems in the formation of the permanent staff: (1) many people selected were difficult to find in the large, crowded downstairs Room C, and (2) some selections defected and required replacement. (See Table 33.) For example, although the second Assistant Shelter Manager declared he would remain after appointed, he defected later.

Examination of staff members' qualifications shows the Information Card method of selection to be fairly effective. A county-level Civil Defense Director was selected as Shelter Manager, a registered nurse was selected as Head of the Shelter Medical Staff. This nurse and another registered nurse, as well as a physician, were provided by CDR. However, the physician did not fill out an Information Card during the temporary phase. The first Administrative Clerk was a secretary, the first Director of Activities was a teacher, and the first Director of Training was a technical publications supervisor. Other positions were filled by similarly qualified personnel. The Handbook suggests that tentative selections for positions of the Shelter Manager, Assistant Shelter Manager, Director of Operations, and Director of Supply and Maintenance should be allowed to decide among themselves who will hold which position, since all were to have similar background requirements. However, Temporary Shelter Manager B ignored this instruction and made her own appointments, judging the experience and ability listed on the cards. (See Figure 2 on permanent staff organization.)

Information Cards were completed within a reasonable time, even though shelterees relied on personal writing instruments. Therefore, there is no need to stock pencils for this purpose. Most of the cards (406 of 433) were correctly filled out.

As an experimental variable, five shelterees under fifteen years of age and without parents were included in the shelter population. The Handbook instructed Section Leaders to appoint guardians to care for these shelterees and to have Information Cards

Table 33  
Sequence and Time of Selection of Permanent Staff  
(ES X)

Position	First Selection	Second Selection	Third Selection	Fourth Selection	Fifth Selection
Shelter Manager	Friday 7:11 P.M.				
Assistant Shelter Manager	Friday 7:12 P.M. <sup>a</sup>	Friday 7:52 P.M. <sup>a</sup>	Friday 10:15 P.M. <sup>a</sup>	Saturday 7:15 A.M. <sup>b</sup>	Saturday 7:30 A.M.
Director of Operations	Friday 7:17 P.M. <sup>a</sup>	Friday 8:15 P.M. <sup>c</sup>			
Head of the Fire Control Team <sup>d</sup>	Friday before 9:15 P.M.				
Director of Radiological Monitoring and Communications	Friday 7:30 P.M. <sup>a</sup>	Friday 8:30 P.M.			
Director of Supply and Maintenance	Friday before 7:30 P.M.				
Director of Training	Friday 7:30 P.M. <sup>a</sup>	Friday 8:30 P.M. <sup>a</sup>	Saturday 9:20 A.M. <sup>c</sup>		
Director of Activities	Friday 8:40 P.M. <sup>a</sup>	Saturday 3:40 P.M.			
Administrative Clerk	Friday 7:30 P.M. <sup>a</sup>	Saturday 7:45 P.M.			
Head of the Shelter Medical Staff	Friday 8:45 P.M. <sup>f</sup>				
Section Leaders	Friday 7 chosen from 6:55 to 10 P.M.				

<sup>a</sup>Defected for reasons such as "too crowded" or "no cooperation from shelterees."

<sup>b</sup>Could not be located by shelter staff.

<sup>c</sup>Same person held the Director of Training and the Director of Operations positions.

<sup>d</sup>Appointed by the Director of Operations.

<sup>e</sup>Job leaflets exchanged between the Director of Radiological Monitoring and Communications and the Director of Training.

<sup>f</sup>First a registered nurse, later the physician (CDR staff members).

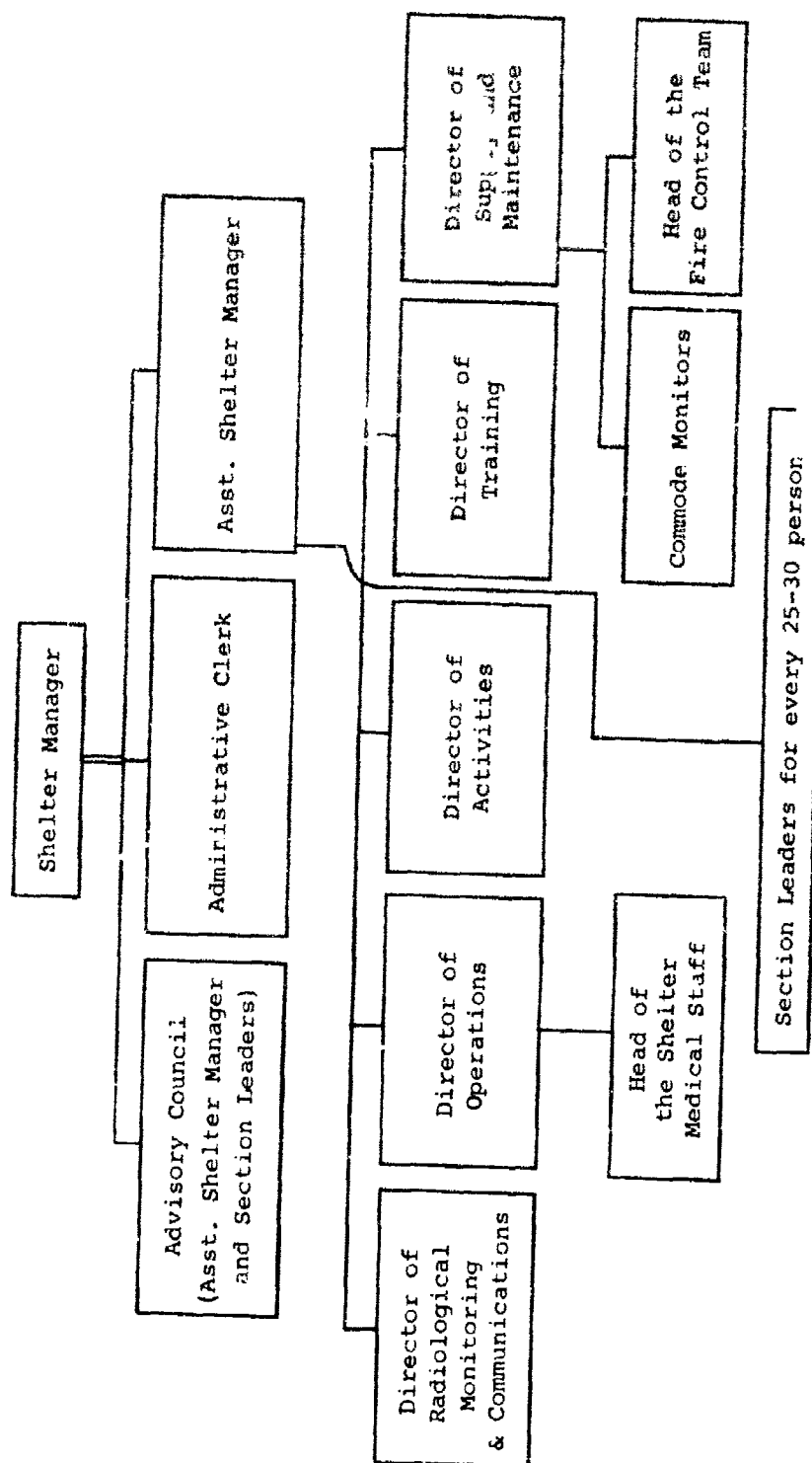


Figure 2. Permanent Staff Structure (ES X).



filed on them. Although all these children were cared for by shelterees, no Information Cards were filled out by guardians, presumably an omission by Section Leaders.

Temporary Shelter Manager B and her assistants had selected the permanent staff members they were assigned to choose by 8:45 P.M. Friday. A general staff meeting was held with both the temporary and permanent staffs in attendance at 9:00 P.M. Friday. The permanent staff was introduced and most of the temporary staff was relieved. The duration of the temporary phase was therefore approximately 3 hours and 20 minutes. Temporary Shelter Manager B and her assistants consented to help in selection procedures for replacement personnel. The Information Cards not being used (those with no categories checked or under-age shelterees) were given to the Administrative Clerk at this time. Several directors used the remaining cards to select assistants designated in their instruction leaflets.

Two directors had no leaflets at this time but they were soon recovered. Permanent staff morale was dampened by this occurrence as well as by the overcrowding in Room C. Added to these problems, defections continued to plague the permanent staff. As has been noted, one staff position was vacated four times, one staff position two times, and four others were vacated once (Table 33). Furthermore, some Handbook instructions had been omitted or changed, and management began to improvise, using the leaflets more as a reference than a guide.

Only about half the number of Section Leaders suggested by the Handbook were appointed. Seven Section Leaders were selected Friday night, giving a ratio of seventy-one shelterees per section rather than the suggested twenty-five to thirty-person sections. Characteristics of the permanent staff are presented in Table 34.

#### D. Completion of Assigned Tasks

##### 1. Temporary Phase

Table 35 shows that 62.6% of the assigned tasks in the temporary phase were completed. Only those tasks that were capable of being carried out under the experimental conditions were included in this calculation. The percentage completed for each position ranged from 0-100. One staff member, the Temporary Security Officer, completed none of her assigned tasks. Temporary Shelter Manager C completed very few of his assigned duties (5%). The low percentage of tasks completed by Temporary Shelter Manager C may have had a direct relation to the low percentage of tasks completed by other members of the temporary staff, since one of his assignments was to check on job completion by the other staff members.

Table 34

Permanent Shelter Staff Characteristics  
(ES X)

Position <sup>a</sup>	Age <sup>b</sup> Sex	Occupational Background	Education <sup>c</sup> (Years)	Marital Status	Number of Children in Shelter	Number of Family Members in Shelter
Shelter Manager	34 M	County Civil Defense Director	11	M	3	4
Assistant Shelter Manager	26 M	USAF, Staff Sergeant (administrative)	13	M	0	1
Director of Radiological Monitoring and Communications	22 M	Technical publications supervisor	18	M	1	2
Administrative Clerk	38 F	Secretary	14	M	2	3
Director of Operations <sup>d</sup>	23 M	Student	17	S	0	0
Director of Supply and Maintenance	39 M	Vice-President, bank	15	M	4	5
Director of Activities	33 F	Housewife	14	M	2	3
Director of Training <sup>d</sup>	23 M	Student	17	S	0	0
Section Leader	23 F	Laboratory technician	16	M	1	2
Section Leader	41 M	City plumber	12	M	3	4
Section Leader	34 M	Accountant	12	M	3	4
Section Leader	38 M	Salesman	13	M	2	3
Section Leader	22 M	Student	16	S	0	0
Section Leader	46 M	Public health sanitarian	11	M	3	4
Section Leader	27 M	Student	16	M	0	0
Section Leader	32 M	Industrial engineer	17	M	0	1
Section Leader	43 M	Insurance claims supervisor	16	M	2	3
<sup>a</sup> Staff members of final organization.						

<sup>b</sup>Mean Age--32.2; age range--22-46; median age--27.<sup>c</sup>Mean Education--14.5; educational range--11-18; median education--15.<sup>d</sup>Same person served both positions (counted as one person in computing averages).

Table 35

Percentage Task Completion by Temporary Staff  
(ES X)

Staff Position	Tasks Assigned	Tasks Completed*
Temporary Shelter Manager A	10	5 (50%)
Temporary Shelter Manager B	15	9 (60%)
Temporary Shelter Manager C	21	1 (5%)
Temporary Radiological Officer 1	8	5 (63%)
Temporary Radiological Officer 2	7	6 (86%)
Temporary Security Officer	4	0 (0%)
Temporary Water Supply Officer	4	3 (75%)
Temporary Food Supply Officer	3	3 (100%)
Temporary Medical Officer	5	4 (80%)
Temporary Communications Officer	7	4 (57%)
Temporary Sanitation Officer	4	3 (75%)
Temporary Ventilation Officer	3	3 (100%)
(Mean 62.6%)		

\*Since percentages are supposed to be computed on a base of 100 or greater, they are used here in a descriptive rather than statistical sense.

## 2. Permanent Phase

Table 36 shows the percentage of assigned tasks completed by each of the staff members in the permanent phase for each day of the study, and the overall percentage of completed tasks. The four Section Leaders included in the tabulation were the only ones for whom sufficient data were available to compute percentage of tasks completed, since the shadow staff were to sample this area of management.

Table 36 shows that from 9:20 P.M. Friday until midnight Saturday a mean of 37% of the assigned tasks were accomplished. From midnight Saturday until 6:00 P.M. Sunday a mean of 38% overall tasks were completed. The range of the overall percentage of tasks completed was 0-80%.

The Assistant Shelter Manager and the Administrative Clerk completed the least amount of overall assigned duties (0% and 15%, respectively). The one person who held positions of both the Director of Operations and Director of Training completed 50% and 80% of the overall respective tasks. Of the thirteen permanent staff members listed in Table 36, eight failed to complete at least 50% of their overall assigned duties.

## E. Shelteree and Shadow Staff Handbook Evaluation

### 1. Shelteree Staff

For purposes of evaluating staff structure, questionnaires were given to members of the shelteree staff after the temporary and permanent phases. Tabulated data from these forms are presented in Table 37.

The response to Question 8, "Did you like the manner in which you were selected to be a staff member?" indicates that the temporary shelteree staff did not like the random method by which they were appointed. Had suggested Handbook procedures of asking for volunteers been followed, this question may have been differently answered. The large number of "unclassifiable" responses given by permanent staff members is due to the fact that such members were unaware of how they had been chosen.

In regard to Question 9, "Would you have volunteered to become a staff member had you not been selected?", the two negative responses of temporary staff members included one officer who failed to function at all (Temporary Security Officer) and another (Temporary Communications Officer) who functioned well but would have preferred to remain with her

Table 36  
Percentage Task Completion by Permanent Staff\*  
(ES X)

Position	Friday-Saturday			Sunday			Total	
	Tasks Assigned	Tasks Completed	Percent of Tasks Completed	Tasks Assigned	Tasks Completed	Percent of Tasks Completed	Tasks Assigned	Percent of Tasks Completed
Shelter Manager	12	5	42	6	2	33	18	39
Assistant Shelter Manager	7	0	0	2	0	0	9	0
Director of Operations	11	5	45	11	6	55	22	50
Director of Supply and Maintenance	16	11	69	9	5	56	25	64
Head of the Fire Control Team	10	5	50	2	0	0	12	42
Administrative Clerk	14	2	14	12	2	17	26	15
Director of Radiological Monitoring and Communications	10	4	40	6	4	67	16	50
Director of Training	5	4	80	5	4	80	10	80
Director of Activities	4	1	25	4	1	25	8	25
Section Leader	16	5	31	11	5	45	27	37
Section Leader	16	4	25	11	3	27	27	26
Section Leader	16	7	44	11	7	64	27	52
Section Leader	16	3	19	11	3	27	27	22
Column Means	11.8	4.3	37.2	7.8	3.2	38.2	19.5	38.6

\*Since percentages are supposed to be computed on a base of 100 or greater, they are used here in a descriptive rather than statistical sense.

Table 37

Shelter Staff Handbook Evaluation in the Temporary and Permanent Phases  
(ES X)

Temporary Phase				Permanent Phase			
Do you feel that your job would be important in case of a real attack emergency?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
12	0	0		19	0	0	
Did you have too much to do?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
2	10	0		2	17	0	
Were your instructions easy to read and understand?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
10	2	0		16	1	2	
Did your instructions fully describe your duties?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
9	3	0		14	2	3	
Did your staff work well together?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
9	2	1		19	0	0	
Should your staff have been larger or smaller, or was it adequate?							
<u>Larger</u>	<u>Smaller</u>	<u>Adequate</u>		<u>Larger</u>	<u>Smaller</u>	<u>Adequate</u>	<u>Unclassifiable</u>
2	0	10		2	0	16	1
Did the other shelterees respect and recognize your staff authority?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
9	2	1		18	1	0	
Did you like the manner in which you were selected to be a staff member?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
6	5	1		11	0	8	
Would you have volunteered to become a staff member had you not been selected?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
8	2	2		14	2	3	
Did you like the way your section of the handbook was organized?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
8	2	2		12	2	5	
Under emergency conditions (war and bombing), would the instructions given you have been adequate?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
10	2	0		14	4	1	

family. Members of the permanent staff who stated they would not have volunteered for a staff position listed "no experience in the field (of Civil Defense)" as the reason.

## 2. Shadow Staff

Shadow staff members also completed staff structure evaluation forms at the conclusion of the temporary and permanent phases. Data tabulated from these sources are presented in Table 38.

Responses to Question 3a, "Did the shelteree staff member that you were shadowing have difficulty in reading and understanding any of the instructions?", would seem to conflict with the responses given by the members themselves. Apparently the shadow staff answered this question in terms of their evaluation of shelteree staff efficiency in the temporary phase. It should be noticed that shadow staff evaluated the permanent staff quite favorably on this question.

With regard to Question 7, "Did the other shelterees respect and recognize your shelteree staff member's authority?", it was pointed out that several temporary shelteree staff failed to wear their identification cards. In the permanent phase, few shelteree staff members exerted any authority until Saturday afternoon.

Shadow staff members were not satisfied with the method of selection used in the temporary phase, evidenced by the number of negative responses to Question 8, "Did you like the manner in which the shelteree staff member that you were shadowing was selected?". Had the selection been performed by Handbook-suggested methods, the frequency of negative evaluations would doubtlessly have been smaller. Selection of the permanent staff also received criticism of the shadow staff, since some replacement members were appointed without utilization of the Information Cards. Furthermore one shelteree held two permanent staff positions, an undesirable situation which was not corrected.

## IV. In-Shelter Program

### A. In-Shelter Activities

#### 1. Emergency Operating Center

The simulated Emergency Operating Center first contacted the shelter at 6:45 P.M. Friday, sixty-five minutes after the shelter was closed. The EOC telephone was used for all shelter

Table 38

Shadow Staff Handbook Evaluation in the Temporary and Permanent Phases  
(ES X)

Temporary Phase				Permanent Phase			
Do you feel that this position would be important in case of a real emergency?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
13	0	0		20	0	0	
Did the shelter staff member you were shadowing have too much to do?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
2	11	0		4	16	0	
Were the Handbook instructions for this position easy for you to read and understand?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
12	1	0		18	0	2	
Did the shelter staff member that you were shadowing have difficulty in reading and understanding any of the instructions?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
11	2	0		1	18	1	
Did the instructions for this position fully describe the duties required?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
11	2	0		17	2	1	
Did the shelter staff member you were shadowing work well with the other shelter staff members?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
10	3	0		18	2	0	
Should the shelter staff have been larger or smaller, or was it adequate?							
<u>Larger</u>	<u>Smaller</u>	<u>Adequate</u>	<u>Unclassifiable</u>	<u>Larger</u>	<u>Smaller</u>	<u>Adequate</u>	
1	1	10	1	2	0	18	
Did the other shelterees respect and recognize your shelter staff member's authority?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
8	5	0		15	5	0	
Do you like the manner in which the shelter staff member that you were shadowing was selected?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
7	6	0		10	8	2	
Do you think qualified shelterees would have volunteered to become staff members had they not been selected?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
11	2	0		16	4	0	
Do you like the way your section of the Handbook was organized?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
12	1	0		16	3	1	
Under emergency conditions (war and bombing), would the instructions given for your staff position be adequate?							
<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>		<u>Yes</u>	<u>No</u>	<u>Unclassifiable</u>	
12	1	0		19	0	1	



communication and was under the jurisdiction of the Temporary Communications Officer during the temporary phase and the Director of Radiological Monitoring and Communications during the permanent phase. EOC also programmed in radiological readings through a wired CDV-715 meter between 6:00 P.M. Friday and 6:00 P.M. Sunday. Table 39 presents Emergency Operating Center announcements and information requested from the shelter.

The first entry in the Radiological Monitor's Log was made at 10:00 P.M. Friday, and the log continues with an entry every half hour until 4:00 P.M. Sunday. For the most part, the entries were very close to the programmed schedule of the CDV-715 meter, indicating that the instructions for reading the meter and logging the entries were successfully followed.



## 2. Sleeping

Sleep, especially of the napping variety, is a popular pastime among shelterees. Sleeping arrangements are under the direction of the Director of Operations. Four major sleep periods can be defined; Friday and Saturday nights, and Saturday and Sunday afternoons after lunch. Many individuals napped at various times throughout each day.

Shelterees quickly settled down after lights-out with few signs of restlessness. Shelterees got more sleep Saturday night (about eight hours) than Friday night (about five hours), retiring earlier Saturday and arising later Sunday. Though some sleeping arrangements were planned and announced by the Shelter Manager, aisles and specific sleeping patterns were nearly nonexistent. The most ordered arrangement was parallel head-to-feet sleeping in family groups. The Handbook suggests segregating single men and single women for sleeping, whenever such an arrangement is possible. This suggestion was not implemented.

Table 39  
Emergency Operating Center Program  
(ES X)

Message Content	Transmission Time	Reply Time
<u>7/22/66</u>		
Request for information concerning: first detected radiation increase; when shelter was filled; sufficiency of supplies; ill and injured; communi- cation equipment, fire-fighting equipment and other tools; ventilation; trained CD workers	6:45 P.M.	7:13 P.M.
Request for in-shelter radiation rate	7:25 P.M.	7:25 P.M.
<u>7/23/66</u>		
Request for names and positions of shelter staff	8:00 A.M.	8:00 A.M.
Request for in-shelter radiation rate	9:40 A.M.	9:40 A.M.
Message concerning local radiation "hot spots"	1:15 P.M.	No reply required
Information concerning location of additional supplies	2:00 P.M.	No reply required
Request for information concerning physical condition of shelter inhabitants	3:15 P.M.	3:22 P.M.
Request for information concerning ability to accept occupants from overcrowded shelters in the area	4:40 P.M.	No reply from shelter
Message that requested information concerning 4:40 P.M. EOC no longer needed	5:30 P.M.	No reply required
Request for in-shelter radiation rate	8:00 P.M.	8:00 P.M.
<u>7/24/66</u>		
Request for supply inventory	8:15 A.M.	No reply from shelter
Request for in-shelter radiation rate	9:30 A.M.	No reply from shelter
Request for list of 15 shelterees to serve on three decontamination teams	12 Noon	No reply from shelter
Request for list of shelterees able to drive farm machinery or road-working equipment	2:00 P.M.	2:55 P.M.

### 3. Medical

The Head of the Shelter Medical Staff is supervised by the Director of Operations. The Temporary Medical Officer sets up and administers the medical area until the permanent medical staff is chosen. A physician and nurse are provided as an experimental condition, and these persons are eventually to fill the medical staff positions.

The medical kit was removed from the supply area about 5:40 P.M. Friday by the Temporary Medical Officer who then posted the medical area sign and proceeded to inventory the kit. At 9:07 P.M. the physician set up the medical area in Room A. One of the physicians played a dissident role and caused morale problems in the shelter; e.g., on the first night he conducted the inventory of medical supplies until after midnight, keeping shelterees awake on the first floor. He also questioned the space allotment per person and advised the shelteree staff to measure it and to question the experimental design on this variable. In these instances, the physician acted on his own and caused unnecessary hostility among the shelterees. One emergency occurred which necessitated hospital treatment of a young girl's lacerated foot. Other medical complaints during shelter occupancy are discussed in another section of this report.

### 4. Recreation

Organized recreation comes under the direction of the Director of Activities. Group singing, successful in only a few instances, was about the only organized activity in ES X. However, small group and individual activities existed most of the time. Such activities included games (especially cards), reading, singing, listening to the radio, coloring and much conversation. General activity picked up on Sunday in anticipation of leaving the shelter.

### 5. Religious Activity

Religious activity is also the responsibility of the Director of Activities. The Handbook suggests specifically that a non-denominational Sunday service be held, conducted by a clergyman if possible.

No clergymen were present among the shelterees in ES X. A ten-minute devotional was held in the two upstairs rooms D and E at 10:30 A.M. Sunday directed by two female shelterees. This was followed at 11:00 A.M. by a thirty-minute shelter-wide non-denominational service downstairs in the large room C under the direction of the Shelter Manager and other shelterees.

Gospel music was heard on several portable radios Sunday morning, and several shelterees were observed reading from personal Bibles.

## 6. Training

The Director of Training's primary task is to train the shelter population in an understanding of the nature of radioactive fallout, in how to meet the problems of shelter living, and in preparation for temporary or permanent shelter exit. He is assisted in his duties by written materials in the form of lectures and supplementary information included in the Handbook.

The Director of Operations took over the duties of the Director of Training when no one could be found who was willing to hold the position. In this dual role he tended to concentrate more on the duties of the former position--Director of Operations--than the latter position. Even so, three training lectures were given by the Director of Training during ES X, one on Saturday and two on Sunday. He chose to give each lecture several times in different rooms of the shelter rather than assemble everyone at one time.

Lecture No. 1 on fallout and radiation was presented over a period from 12:40-3:15 P.M. Saturday. Lecture No. 2 was presented on Sunday over a period from 8:30-9:35 A.M. and covered the subject of decontamination. Lecture No. 3, concerning sanitation and other aspects of post-shelter living, was given over a period from 12:50-2:05 P.M. Sunday. Lectures (and question and answer discussions following them) lasted about ten to twenty-five minutes.

## 7. Exercise

The Director of Activities is responsible for organized exercise periods for shelterees. When exercise was organized it was on a room basis. Individual and small group exercising took place. Exercises ranged from simply standing and stretching to standard whole-body exercises.

## 8. Nursery

A nursery, under the direction of the Director of Activities, is suggested by the Handbook to provide parents with a break from responsibility for their children and to allow activities (e.g., training lectures) which would otherwise be difficult or impossible for parents to attend. However, only one nursery period was set up, from 11:00-11:30 A.M. Sunday during the shelter-wide church service, and was administered by the older children.

## 9. Feeding

The shelterees were faced with the realistic situation of an unequal distribution of supplies throughout the rooms of the shelter, most supplies being stocked in Room A (downstairs). The Director of Operations is responsible for distribution of food and water. All shelterees had received their first ration of food and water by 9:00 P.M. Shelterees were allowed to bring with them food items of their own and much of the early eating (shelter-wide and individual) involved these foodstuffs.

Shelterees did not follow Handbook suggestions concerning food and water distribution. Specific times were set aside for eating and drinking in each room throughout most of the study. However, the unguarded, open supplies encouraged the disregard of this schedule; and, in practice, the shelterees ate of the shelteree stock what they wanted when they wanted.

After discovering that there were two-weeks' supplies for a two-day occupancy, the Director of Operations, apparently ignoring his Handbook instructions, decided to discontinue rationing. Food and water were distributed unsanitarily. As previously mentioned, many stocks remained open and uncovered all day. After encountering siphoning problems, shelterees resorted to oral siphoning and other unsanitary methods such as dipping for water. Often the biscuit and carbohydrate supplements were handled with dirty hands, though in one case plastic gloves were employed. Rubbing alcohol from the medical kit was used occasionally in Room D to disinfect hands.

## B. Medical Complaints

### 1. Medical History Questionnaire and Medical Aspects of Pre-Shelter Processing

The procedure for medical coverage during pre-shelter processing has been discussed previously. Four physicians and two registered nurses were on hand to examine all subjects fifty years of age or older and any other subject who presented current medical complaints. No subject was rejected from participation in ES X for medical reasons.

### 2. Medical Personnel and Supplies

The in-shelter medical team was composed of two physicians who served alternately for eight-hour shifts and six nurses who worked on three eight-hour shifts in groups of two. Throughout the shelter confinement period, the medical staff kept a record of names, ailments, and medicine dispensed. In addition, the on-duty physician was to give each shelteree requesting release prior to the scheduled exit a medical examination, and he was

also to complete a Defection Medical Report for such defectors. In the event that emergency medical service might be needed, ambulance service and both local hospitals were alerted.

An emergency medical room was provided outside the shelter area on the second floor of the Costa Building. During the initial temporary phase the Temporary Medical Officer, ignoring Shelter Handbook instructions to find a quiet location, established the medical area in the southeast corner of Room C next to the shelter provisions. When the permanent phase began, the medical area was relocated in Room A, a less crowded area.

Two standard OCD Medical Kits C were stocked with supplementary medical supplies based on recommendations from previous shelter physicians (see Table 62).

### 3. In-Shelter Medical Complaints

The nature of medical complaints during ES X followed a pattern similar to that of previous studies. Headache, which registered on the in-shelter medical record a total of 94 times, represented the most frequent complaint (see Table 40). Next to headache, cuts and abrasions were the most frequent complaint with twenty-four listed in the course of the study. This relatively large number of cuts appears to be the result of contact with the jagged edges of opened metal food containers, from both personal food cans and OCD ration cans.

It is interesting to note that "can't sleep" became a major problem in this study; physicians recorded twenty-two cases of insomnia, beginning as early as 12:30 P.M. on the afternoon of the second day of the study. It is possible that this increase is related to one physician's attempt to prevent defections by informing the shelterees that he could help people to sleep.

Seventy-two male and one hundred and forty female shelterees with medical complaints were registered during the forty-eight-hour shelter period. Females were more numerous in all but one of the diagnostic areas, including headache, nausea and stomachache, cuts and abrasions, cold and sore throat, insomnia, toothache, and the miscellaneous category than were males. When analyzed by age groups as well as sex, females between twenty and thirty-nine years of age presented 33.4 percent of persons complaining, whereas this age group composed only 18.9 percent of the shelter population.

One medical emergency occurred on Saturday at 1:35 P.M. when an eleven-year-old girl was taken to a local hospital for five stitches in her left foot, which had been lacerated on an opened meat can.

Table 4)  
In-Shelter Medical Complaints by Shift and Sex Group  
(ES X)

Complaint	Shift																		Total*						
	Fri. 5-11			Sat. 11-7			Sat. 7-3			Sat. 3-11			Sun. 11-7			Sun. 7-3					Sun. 3-6				
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
Headache	1	1	2	-	1	1	15	37	52	5	11	16	1	2	3	7	10	17	-	3	3	29	65	94	
Cuts, abrasions, infections	-	1	1	-	1	1	4	7	11	4	5	9	-	-	-	-	1	1	1	-	1	9	15	24	
Insomnia	-	-	-	-	-	-	2	2	4	5	12	17	1	-	1	-	-	-	-	-	-	8	14	22	
Cold, sore throat	-	-	-	-	1	1	1	6	7	1	-	1	-	-	-	6	4	10	-	-	-	8	11	19	
Nausea, stomachache	-	-	-	-	-	-	3	2	5	1	5	6	-	-	-	2	4	6	1	-	1	7	11	18	
Fainting, dehydration	-	2	2	-	-	-	-	1	1	4	4	8	-	-	-	-	2	2	-	3	3	4	12	16	
Swelling	-	-	-	-	-	-	1	-	1	1	2	3	-	-	-	1	-	1	-	-	-	3	2	5	
Body ache	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	0	5	5	
Toothache	-	-	-	-	-	-	-	1	1	-	4	4	-	-	-	-	-	-	-	-	-	-	5	9	14
Miscellaneous <sup>1</sup>	-	-	-	-	-	-	-	4	4	3	2	5	1	-	1	1	3	4	-	-	-	-	-	-	-
	Grand total																		73 144 217						

\* A shelteree could have more than one complaint; therefore, this table contains a greater number of complaints than the number of shelterees complaining.

<sup>1</sup> Allergic reactions (2), nervousness (2), irritations (4), diarrhea (1), hunger (1), dizziness (1), menstrual bleeding (1), nose bleed (1), blister (1).

The greatest number of medical complaints occurred Saturday between the hours of 7:00 A.M. and 3:00 P.M., during which time a total of eighty-six complaints were voiced (see Table 41). Sixty-nine complaints were recorded from Saturday, 3:00 P.M. to 11:00 P.M. The period ranked third in regard to the frequency of medical complaints was Sunday, between the hours of 7:00 A.M. and 3:00 P.M., when forty-one complaints were registered.

It should be noted that in studies where food supplies were brought by shelterees, the nausea complaints were relatively less frequent than in studies where OCD food alone was permitted.

#### 4. Relationship of Headache Complaints to Noise Level

During waking hours of the study the overall mean noise level was 73.2 decibels, with a maximum reading of 85 decibels, and a minimum reading of 64 decibels. For further details on these and other measurements, see the Environmental Variables section of this study report.

Since noise level is logarithmic in character,

$$n = 10 \log_{10} \left( \frac{I}{I_0} \right),$$

where  $n$  = noise level in decibels,  $I$  = Intensity of source, and  $I_0$  = Intensity of reference source, then a change from 64 decibels to 85 decibels is not just an addition of 21 decibels but rather a change equivalent to approximately 130 times the noise level of 64 decibels.

The possibility that noise level contributed to headache complaints was investigated. On Saturday there were 19 headaches registered at 12 noon, corresponding to a peak of 85 decibels noise level during this period.

There is some reason to believe that there is a relationship between noise level and headaches after computing the correlation for Saturday ( $r = .33$ ). For Sunday the relationship was inverse ( $r = -.73$ ) due to a drop in registered complaints of headaches and an increase in noise level. However, these readings were within hours of shelter exit and probably fewer headache complaints were made to the physician at this time, and the noise level was of a different nature, *i.e.*, exit-anticipation noise as contrasted to the shelter activity noise of Saturday.

It should be realized, of course, that other factors, such as overcrowding and heat, can contribute to headache complaints.



Table 41

Daily Number of Shelterees with Medical Complaints  
(ES X)

Shift	Age Group	Male	Female	Total*
Friday 5-11 P.M.	0-5	0	0	0
	6-12	0	1	1
	13-19	0	0	0
	20-39	1	3	4
	40-54	0	0	0
	55+	0	0	0
				5
Friday 11 P.M.- Saturday 7 A.M.	0-5	0	0	0
	6-12	0	0	0
	13-19	0	1	1
	20-39	0	1	1
	40-54	0	1	1
	55+	0	0	0
				3
Saturday 7 A.M.- 3 P.M.	0-5	1	1	2
	6-12	3	9	12
	13-19	1	4	5
	20-39	10	33	43
	40-54	9	11	20
	55+	0	1	1
				83
Saturday 3-11 P.M.	0-5	1	1	2
	6-12	4	8	12
	13-19	3	5	8
	20-39	9	20	29
	40-54	7	10	17
	55+	0	0	0
				68
Saturday 11 P.M.- Sunday 7 A.M.	0-5	2	0	2
	6-12	0	0	0
	13-19	1	1	2
	20-39	0	0	0
	40-54	0	1	1
	55+	0	0	0
				5
Sunday 7 A.M.- 3 P.M.	0-5	0	4	4
	6-12	2	5	7
	13-19	1	0	1
	20-39	14	11	25
	40-54	1	2	3
	55+	0	1	1
				41
Sunday 3-6 P.M.	0-5	0	0	0
	6-12	0	2	2
	13-19	0	0	0
	20-39	2	3	5
	40-54	0	0	0
	55+	0	0	0
				7

Grand Total 212

\*This table has less total complaints than the previous one; it is based on number of shelterees complaining, not number of complaints.

### C. Post-Shelter Medical Reports

The following reports, received from all physicians and nurses participating in ES X, are presented as they were authored, with only minor organization and editing.

#### 1. Physicians' Reports

- a. Physician No. 1, Alternate 8-Hour Duty (7/22, 5 P.M.-11 P.M.; 7/23, 7 A.M.-3 P.M.; 7/23-24, 11 P.M.-7 A.M.; 7/24, 3 P.M.-6 P.M.)

- (1) The medical staff was "detected" by one of the shadow staff at 8:30 P.M. on 22 July, 1966. Apparently none of the original nurses (two), nor the physician, nor two shelterees who were nurses, nor an L.P.N. were detected by the Information Cards. The Temporary Medical Officer was not responsible in the administration of medications.
- (2) An inventory check was done on the two stocked medical kits at 11:30 P.M. on 22 July, 1966.
- (3) The cot was used for an elderly woman who was "feeling faint." This was considered quite a useful addition to the medical supplies.
- (4) Shelterees in the small room where the medical area was located numbered forty-two. The space was 7.2 square feet/person.\* Cooperation in this room was excellent in both setting up the medical area and in reorganizing the room the following day in order to provide greater comfort for nighttime sleeping arrangements. There were three defections from the room, two of which were probably due to the mother's medical problem.
- (5) Almost all defections were non-medical, and the medical staff processed all of them except those who left before the physician was identified.
- (6) Most shelterees who visited the medical area came because of headaches, inability to sleep, nausea, colds, toothaches, or superficial abrasions requiring Band-Aids.
- (7) One shelteree, a young girl, lacerated her left foot on an opened meat can which had been brought in by a shelteree. She was taken to a local hospital, where five stitches were put in and a tetanus booster was given, and she returned to the shelter for completion of the study.

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\*An incorrect calculation. Actual space resulting in this room was 8.4 sq. ft./person.

- (8) Only one shelteree complained of diarrhea, which speaks well for sanitary conditions. There also seemed to be fewer complaints of nausea than in previous studies, and no complaints of vomiting were registered.

Suggestions:

- (1) The Temporary Medical Officer should be warned in bold-captioned letters NOT to administer medicines prior to determining if there is a more qualified person, e.g., physician, nurse, etc., available.
- (2) Medications stocked either in the standard medical kits or in the supplementary medical kit were adequate.
- (3) A physician's medical bag should be in the shelter.
- (4) The leadership potential in ES X was minimal and could indicate that the shelteree potential from the Athens area has been exhausted. It seems unlikely that a random selection would comprise a group having less leadership than was manifested in ES X.

b. Physician No. 2, Alternate 8-Hour Duty (7/22-23, 11 P.M.-7 A.M.; 7/23, 3 P.M.-11 P.M.; 7/24, 7 A.M.-3 P.M.)

- (1) Medical Kit C in combination with supplementary supplies provided in ES X for 500 persons was adequate for two weeks of emergency confinement. The Kit was well equipped, so that either a physician, a nurse, or an interested layman could readily manage the majority of medical problems which might arise. More specific evaluation follows:
  - (a) Unnecessary items--Considering the spectrum of medical complaints, from headache and fainting to moderate lacerations, along with projected serious conditions such as myocardial infarction, seizures, and massive bleeding secondary to trauma, the supplies as stocked possess no unnecessary items.
  - (b) Additional items which might be necessary under emergency conditions include:
    - 1) Tetanus toxoid. In all likelihood, this item was not provided during ES X because refrigeration was not available; however, in spite of this problem it is an obviously needed item.
    - 2) A larger amount of supplies to handle minor cuts, lacerations, abrasions, etc., may well be required. Specifically, a supply of Band-Aids four times the present

supply might be needed over a two-week period. During the 48 hours of BS X, well over 40 of the 135 available Band-Aids were used. The supply of gauze and adhesive tape appears adequate.

- 3) Antibiotics in Medical Kit C consist of Penicillin and Sulfadiazine, which cover the larger spectrum of super-infective bacteriologic agents. Allergy to these medications runs fairly high in the general population, however, and may pose a serious problem in the use of these antibiotics. The following antibiotics are recommended to substitute for presently stocked medications in the event of allergic reactions:

- a) Erythromycin (200 mg/5cc) to cover for Penicillin allergy.
- b) Tetracycline (125 mg/5cc) to cover for sulfa allergy if needed for acute urinary tract infection. This broad-spectrum antibiotic should be a better addition for urinary disease than Furadantin, which frequently presents side effects of nausea and vomiting.

A medical kit equipped with Penicillin, Sulfadiazine, Erythromycin, and Tetracycline would afford excellent coverage when antibiotics are required.

- c) There were no non-included items which should replace currently provided items.
  - d) The available medical supplies are complete and exhibit thought, trial, and discretion in their selection.
- (2) The majority of complaints were those of "headache," minor lacerations via cuts, and nausea without vomiting. Virtually all of the complaints seemed to be the result of shelter confinement, in that in only a few instances did problems appear to be genuine and actually require medication. However, in order to maintain harmony in the shelter, medications were distributed to those who persisted in their complaints. Between 8:00 and 10:00 P.M., large numbers of persons, many of them women, requested sleeping medication. The following A.M., they all reported having slept well, which exemplifies vividly the magical powers of "a pill", which consisted of aspirin, 5 gr. No one returned for additional sleeping medication during the nights.

Minor cuts and lacerations occurred in fairly large numbers, due to children running about barefooted and individuals carelessly leaving open cans and tops lying on the floor. After the announcement

was made that shoes should be worn, few cuts were evident.

- (3) Trends in the nature of complaints followed the time of day and general temperament of the group. More specifically, in the afternoon and early evening during the warmest part of the day, the complaints were considerably larger in number. Few medications were dispensed before noon or after 10:00 P.M. Also, when minor problems such as "headaches" arose, groups would accompany a complainer, all requesting medication. Nausea without vomiting arose during the second day of the study, primarily among children who had not eaten food nor drunk water at recommended intervals. Medical problems which might be anticipated include diarrhea, constipation, vomiting, and continued minor trauma dependent upon the cleanliness of the group as well as maintenance of discipline.
- (4) General sanitation of the shelter left much to be desired in that it was not until the last day of the study that regular sweeping and proper handling of garbage was undertaken by the shelter group. Cans, papers, food remains, etc., were left about until the Sanitation Officer asserted himself.

The chemical commodes functioned fairly well, but the odor from excrement became quite noticeable at times. The exhaust fan, manually operated, did an excellent job of removing obnoxious odors; however, it did little to improve the general ventilation of the large roomful of people on the first floor.

At no time did the group set up basins for washing after commode use. This aspect was pointed out to the Sanitation Officer, but he did not institute such a plan.

Water distribution was poorly handled for the largest room of people. Instead of one central area of distribution, perhaps two or three areas would be more efficacious and expeditious.

- (5) The adequacy of Handbook instructions for medical personnel and the Medical Care in Shelters booklet were quite good. The inclusion of information concerning use and dosage of medications is a particularly good precaution; however, this information covers only medications stocked in Medical Kit C and should be amplified to cover supplementary items as well.
- (6) The majority of defections did not occur during the writer's shifts. Those that were encountered involved minor reasons for leaving and did not constitute any overt medical reason to defect, save for a three-month pregnant lady who began to experience dysuria. Most reasons cited as cause for defection were fatigue or discomfort with limited space. Several groups were dissatisfied with the permanent shelter staff organization; however this was general and not specifically directed to particular staff members.

- (7) In general, ES X was moderately crowded in comparison with ES IX. There were relatively few people who did not have a place to sleep, and eventually they were able to make suitable arrangements for themselves. The shelterees population had difficulty in making suitable storage arrangements for water cans, food cans, etc., which further emphasized space limitations. The recent heat wave did not appear to have any great effect on shelter temperature and humidity, which remained quite comfortable throughout the study.

None of the shelterees sought information concerning the medical kit and its uses. There is a strong need for individuals to assist in the operation of the medical area, and to this end clear mention should be made in the Shelter Handbook.<sup>\*</sup>

The ES X group did not seem imaginative or interested in group activities. Very few persons ventured beyond what was outlined in the Handbook. However, the people appeared to mingle well and seemed happy, pleasant, and conservative. The groups in the smaller rooms of the shelter area tended to be better organized than those in the large room, and they exhibited considerable pride in their harmonious accomplishments.

## 2. Nurses' Reports

a. 7/23, 7:00 A.M. - 3:00 P.M.

### (1) Nurse No. 1

- (a) The supplements to Medical Kit C were excellent. These items had been recommended in previous studies. The supply would seem adequate for five hundred people for two weeks.
- 1) None of the supplementary items would be unnecessary in the event of a real emergency situation. Many supplies were not used during ES X, but for a two-week confinement they would certainly be needed.
  - 2) Additional items needed for realistic shelter conditions are:
    - a) tetanus toxoid or the newer preparation of tetanus anti-toxin and gamma globulin combined;
    - b) supplies and medications for childbirth;
    - c) splints for fractures;
    - d) prepared, canned formulas for infants and
    - e) disposable diapers.

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<sup>\*</sup>Handbook instructions do suggest this.

- (b) Headaches and nausea seemed to be the major complaints. The heat and crowded conditions were largely responsible for this. A large number of people were unhappy and angry about crowding, since they had not anticipated this.
- (c) More emphasis should be put on cleanliness in the shelter rooms and toilet areas. Nausea complaints would probably diminish if something could be done to lessen toilet odor. The use of hair sprays and perfumes by some well-meaning shelterees tended to mask odors for some and to add to the nausea discomfort of others. In a longer period of confinement, unsanitary conditions would certainly contribute to nausea, vomiting, and diarrhea.
- (d) When people are allowed to bring extra food, they do not bring the foods most needed for general well-being. They would probably get along much better if only the shelter rations were available and if everyone was encouraged to eat their rations at each distribution. The "cracker" in ES X was very good; but many people ate such things as candy, salty crackers, pork and beans, potato sticks, etc., instead of the rations provided.
- (e) The booklet, Medical Care in Shelters, is very good. A lay person with intelligence and preferably some medical knowledge could follow instructions in the booklet fairly well. No one seemed interested in medical supplies or questioned who would be in charge of medicines in a real situation in which nurses and doctors probably would not be present.
- (f) Defections were mainly caused by crowding and a generally uncomfortable situation. Defectees could only think of how comfortable they would be at home, with no attention to the value of the shelter experience. One family of five left in the mid-morning of the day the study terminated; the wife and children were tired and unhappy and wanted to go home, so the father took them with no encouragement for them to remain the last few hours. None of the defections seen during the 7:00 A.M.-3:00 P.M. periods had medical reasons for departure. They were tired and uncomfortable, complained about the heat, crowding, and the uncooperative attitude of some persons around them.
- (g) Many people had cuts and scratches from tin cans. One child had a foot laceration that required hospital attention. This accident could have been prevented if the Shelter Manager or group leaders had insisted that all tin cans and sharp objects be put in trash cans immediately after their contents were used. Food brought into a shelter should be put into a central control area with persons designated to be responsible for its use. Unless an injury or illness is severe, a doctor should not leave the shelter to accompany the injured or ill person to the hospital. A nurse or relative or other shelter inhabitant could accompany the patient,

leaving the doctor to care for more important emergencies that might arise. The danger of fire is very evident. Smoking areas should be designated and rules of No Smoking in other areas strictly enforced. Smoking with blankets, papers, etc., lying around certainly does not fit well into safety precautions. Participation in the study was a valuable experience.

(2) Nurse No. 2

(a) Medical Kit C and the supplementary items would seem to be sufficient for 500 persons for two weeks.

- 1) All items in Medical Kit C and the supplementary supply seemed of great value and use. The supplementary items were in greater demand than the standard Medical Kit C supplies.
- 2) It would seem better to supply Zephiran Chloride solution as an all-around antiseptic rather than alcohol.
- 3) An item not included in ES X medical supplies that should be included is tetanus toxoid; however, since the drug requires refrigeration, this presents a problem. Its use would be in the treatment of the many cuts which are to be expected within the shelter. A universal tranquilizer would be another medication to be considered, because a majority of the population is already taking such medication, and it is also likely that tensions would mount considerably in a national crisis.
- 4) Other medical supplies to be considered as part of shelter stocks would include a half dozen or so folding stretchers for carrying the sick. Blankets and sheets could be substituted to meet this need. Also, it would seem preferable to have liquid surgical soap rather than bar soap, since water may well be too scarce to use with bar soap.

(b) Major complaints:

- 1) Headache--This was to be expected under crowded conditions accompanied by lack of comfort, bedding, food, etc.
- 2) Throat and nasal congestion--This may also be expected, due to lying on the floor, cool nights, and poor sleeping arrangements.
- 3) Nausea--This was due to shelteree laxity in disciplining themselves with routine food and water intake from standard shelter supplies, rather than depending on foods brought into the shelter. Nausea seemed more common among children who did not eat the crackers as they should.



- 4) Insomnia--Many shelterees requested sleeping medication, but a mild sedative in the form of aspirin was generally given in its place.
- (c) As for the nature of medical complaints, when shelterees found that there was a medical unit supplied with aspirin, everyone seemed to have a headache. This type complaint subsided in the second twenty-four hour period, indicating that some adaptation to circumstances had taken place and that the anticipated end of the study was near.
- (d) Sanitation was not a major problem in ES X; however, it would probably be worse in a real emergency situation. It would be wise to consider a Lysol solution for hand cleansing in commode areas. Crowding and dirty floors would seem unusually problematic for infants, since adults generally can stand much more.
- (e) The Handbook with instructions for medical personnel is very adequate. The booklet, Medical Care in Shelters, is illustrated sufficiently so that a lay person with some medical background or association could set up his own medical area and perform well.
- (f) Those shelterees who defected in the first twenty-four hours came with a wrong image of what the experience would be and used no imagination in adapting to their situation. The dominant reason for leaving was the critical shortage of space and the fact that one room was closed to shelter use after the study began. During the 7:00 A.M.-3:00 P.M. shift, only one defection seemed of a medical nature: a pregnancy with a cystitis condition. After taking medical histories from those who wanted to defect, it was found that many had not given valid information during pre-shelter processing--several persons appeared to have failed to report such things as low-grade fevers, nausea, pre-existing allergies, or colds. Of course, under real conditions all these symptoms will be present. The monetary reward was a great factor in the perseverance of shelterees who completed the study.
- (g) As for general shelter management, restlessness seemed a great symptom. Organization of groups and more participation of individuals in specific activities suited to their abilities would be a considerable help. For example, teachers could take charge of children, other persons could organize and lead group singing, while other persons could plan and implement talent shows, etc. Many people could not hear announcements. Section leaders needed to assert themselves more within their sections in order to assure section members' cooperation in eating schedules, etc. Shelterees were most attentive during the three lectures on fallout. The reduced space allotment was irritating to many. The medical team felt it wise to find interested lay persons and to teach them a few medical arts; however, only one person showed interest, and

that was a seventh grade girl. The location of the medical area was good in that it was accessible yet relatively inconvenient to reach unless the need was important. A shelter should be staffed at all times with a physician; and if emergency treatment is needed outside the shelter, a nurse rather than the doctor should accompany the patient. Most nurses and trained ambulance attendants can handle emergencies en route to a hospital.

b. 7/23, 3:00 P.M. - 11:00 P.M.

(1) Nurse No. 1

- (a) The supplies available in Medical Kit C and among the supplementary items would be adequate, if properly dispensed, for five hundred persons confined for two weeks under real emergency conditions. In the event the person responsible for medical supplies has a minimum of medical experience, there should be detailed, obvious instructions for him, e.g., ATTENTION: READ HANDBOOK BEFORE PROCEEDING FURTHER.

No medicine is to be dispensed, unless an emergency arises, without the consultation of a doctor.

If a person requires medication, ask about allergies before dispensing.

The Temporary Medical Officer in ES X did none of these things; therefore pertinent, clear instructions may help the situation.

- 1) All items in the medical supplies are necessary. The supply of cotton may be larger than is needed.
  - 2) Ace bandages are a definite need. The need arose for two of these during ES X, and in a real emergency there will be falls producing sprains requiring the use of bandages.
  - 3) A two-week confinement would probably require a greater supply of powdered milk. The average mother probably would not bring enough to meet the needs of her child.
- (b) There were two major medical problems: a foot laceration and an infected finger cut before entering the shelter. Shelterees should definitely be instructed to wear shoes. This precaution would virtually do away with foot lacerations.
- (c) During the first eight hours, shelterees apparently did not realize the availability of medical care, and complaints were few. On the second day, headache was the chief complaint. Aspirin was dispensed as necessary. Stomachache complaints would probably have increased over a longer confinement period, since meals and diet were so irregular.

- (d) Sanitation in the shelter was good, considering the number of people. A soap-and-water detail should have been established outside the commode areas much sooner than it was. Trash was kept to a minimum through the use of water cans as containers. People should not be allowed to bring their own food; this would alleviate much of the trash as well as other sanitation problems such as bugs.
- (e) The Handbook material for medical personnel is adequate. Anyone who can read should be able to understand it. The booklet, Medical Care in Shelters, is instructive and should be readily understood.
- (f) The dominant reasons for defection were psychological, not physiological. The two defections who evidenced a medical basis for leaving were two pregnant women.
- (g) The first shelterees to enter the shelter should have been directed to go upstairs, and the shelter Information Cards could have been handed to them as they went up the steps. The large collection of confused, unorganized people detained in the downstairs area was unbelievable. The defection rate would probably have been cut considerably had there been more pertinent instructions to the shelterees when they entered the shelter area. Immediate attention to getting people located and settled would have been of considerable help to everyone. The shelter leaders did not make it known who they were or what they were doing. There would have been more cooperation and less disorganization had the group been appealed to and instructed.

(2) Nurse No. 2

- (a) The following comments pertain to Medical Kit C and supplementary medical supplies:
  - 1) A small kit labeled "Physicians' Kit" might be packaged separately as part of Medical Kit C and contain restricted items such as antibiotics, Morphine, etc.
  - 2) Splints would likely be needed in real circumstances.
  - 3) All the items comprising the supplementary supplies would be of great help.
- (b) Headache was the most frequent complaint. Most complainers stated they were prone to have headaches.
- (c) During longer periods of confinement, various other medical complaints are likely to become more frequent than they were in ES X: nausea, indigestion, cuts and scratches, insomnia, nervousness, nasal congestion, and upper respiratory infections.

- (d) The Medical Care in Shelters booklet seems quite adequate.
- (e) Various sanitation concerns, such as washing of hands, emptying garbage and its disposal, dispensing drinking water, caring for drinking cups, wearing shoes, etc., should be the concern of the medical staff.
- (f) Most defections were due to inadequate space. There were no obvious medical defections during the 3:00 P.M.-11:00 P.M. shift.
- (g) General shelter management was satisfactory. Locating families in central areas, with single persons on either side, seems the best sleeping arrangement. Organization was weak in ES X: there was no introduction of the staff and very few general talks to the group; however, cooperation seemed good.

c. 7/23-24, 11:00 P.M. - 7:00 A.M.

(1) Nurse No. 1

- (a) Medical Kit C and supplementary medical items were most adequate. However, in the event of a high incidence of diarrhea, the Kao-pectate supply would be exhausted in three days or less. Donnagel-PG would be much more effective than Kao-pectate, or even several bottles of Paregoric. A disinfectant such as Lysol should be available for cleaning commode seats before use.
  - 1) As for unnecessary items, there was too much cotton (one roll would be sufficient) and too much alcohol.
  - 2) Zephiran 1:750 would be much more effective than alcohol, especially with regard to staph infections.
  - 3) Elixir of Phenobarbital would be quite beneficial for use with children.
  - 4) Most supplies stocked in ES X certainly would be useful in actual disaster situations.
- (b) Headache was the major medical complaint. All seemed to be based on the situation within the shelter: noise, concern over children in abnormal surroundings, lack of daily comforts, abnormal diets, lack of privacy, and, possibly, boredom.
- (c) It was evident that many medical complaints following early hours in the shelter were registered by the same persons a second, third, etc., time. Hypochondria could well be a major medical problem during a longer period of confinement.

- (d) Sanitation in the shelter should be stressed more. Over a two-week period, conditions would probably become unbearable without very efficient attention to sanitation problems. Although conditions did not become too bad during the forty-eight hours of ES X, King-O-Deodorant would have completely dispelled odors from the commode areas.
- (e) The 11:00 P.M.-7:00 A.M. night shift afforded little opportunity to examine the written materials for medical personnel; however, the information that was seen appeared very good and was written in a manner which lay people could understand.
- (f) The defections that occurred during the night hours were caused mainly by lack of comfort. Bedtime is a crucial time for discomforts to be felt keenly. There were no defections because of actual medical problems.
- (g) There was a definite atmosphere of apathy in the shelter, and over a two-week period this could be disastrous, medically speaking. People with nervous conditions would become more nervous, and those without nervous conditions would soon develop them. Also, tempers would run high, fights would ensue, bringing about lacerations, broken bones, and other calamities. To prevent this, there should be a strong and imaginative social chairman who would be responsible for things such as group singing, talent shows, storytelling, and other group-oriented activities. This would serve to deflect attention from fear and other debilitating emotional conditions.

(2) Nurse No. 2

- (a) Under real emergency conditions, more sedation would probably be necessary. In ES X, Elixir of Benadryl was used for children and infants. Phenobarbital was available only in 1/2 gr. tablets. Phenobarbital is needed for infants, either in elixir form or in smaller dosage tablets. Otherwise, the Medical Kit C and supplementary items were quite adequate.
- (b) During the 11:00 P.M.-7:00 A.M. shift, complaints of headache and insomnia were the most frequent. Another complaint was burning during urination, caused by decrease in liquid intake and physical activity.
- (c) There appeared to be no real trend in medical complaints. During a period of longer confinement, complaints of insomnia and diarrhea would probably increase.
- (d) The problem of odor in the commode areas was terrific! Some type of deodorant is needed. Sanitary napkins were placed in the women's commode areas under no supervision. In a two-week period,

the supply would likely be exhausted if everyone is allowed to use the napkins freely.

- (e) The Handbook instructions for medical persons and the stocked booklet, Medical Care in Shelters, appeared adequate.

#### D. Shelteree Reactions

##### 1. Shelter Diaries

All shelterees were asked to fill out an unstructured diary twice daily, 9:00 A.M. and 9:00 P.M. Diary forms were not filled out Friday evening as not to interfere with the activities of the shelter staff at that time.

A total of 1141 diaries was collected from the three distribution periods (Saturday morning and evening and Sunday morning). Of this number, 300 diaries were randomly selected as a sample. Later analysis of the sample disclosed that it was statistically representative of the total diaries collected, when compared on the variables of age and sex. (See Tables 42 and 43.)

Four hundred and eighty-six comments were scored. Criteria for scoring these comments were the same as used in previous studies. (See the 1965 Final Report titled Shelter Occupancy Studies at the University of Georgia [Hammes, et al].) Examples of comments negatively scored are: "It is too crowded" (Space) and "I wish I could take a bath" (Personal Sanitation). A statement such as "Everyone has been so friendly and cooperative" (Other People) was placed in the positive category.

Table 44 and Figure 3 depict the relative daily percentages of positive and negative comments by both males and females. There was an approximately equal number of positive and negative comments scorable.

Table 45 reveals the percentages of positive comments made by both males and females. Table 46 is a similar table for negative comments. Again, shelterees tended to make very general positive statements, but more specific negative statements.

##### a. Space

The frequency of complaints about limited space places this item first on the list of negative comments made by both males and females. Of all the negative comments, 21.5% mentioned space. Fifty-three percent of the negative comments regarding space appeared in the first diary sample, but only 14% were found in the third sample. A possible

Table 42  
Comparison of Total Collected Diaries and  
Sample by Age Group and Sex  
(ES X)

Age Group	Male		Female		Total
	Number	Percent <sup>a</sup>	Number	Percent <sup>a</sup>	
1-16					
Diaries Collected	242	47.4	268	52.6	510
Sample	60	48.0	65	52.0	125
17-40					
Diaries Collected	160	37.9	262	62.1	422
Sample	46	39.0	72	61.0	118
41-70					
Diaries Collected	53	25.4	156	74.6	209
Sample	16	28.1	41	71.9	57
Total Diaries Collected	455	39.9	686	60.1	1141
Total Sample	122	40.7	178	59.3	300

<sup>a</sup>Percentages are based on the total for each age group.

Table 43  
Comparison by Day and Sex of Total Collected  
Diaries and Sample  
(ES X)

Date and Time	Total Diaries				Diary Sample			
	Male		Female		Male		Female	
	Number	Percent*	Number	Percent*	Number	Percent*	Number	Percent*
Sat. (23 July)								
9 A.M.	154	33.8	230	33.5	43	35.2	57	32.0
9 P.M.	151	33.2	226	33.0	39	32.0	61	34.0
Sun. (24 July)								
9 A.M.	150	33.0	230	33.5	40	32.8	60	33.7
Total	455	100.0	686	100.0	122	100.0	178	100.0

\*Percentages are based on the total number for the entire study in each category.



Table 44

Percentage Comparisons of Frequencies of Positive and Negative  
Responses on a 300-Person Unstructured Diary Sample  
(ES X)

Day	Date	Male Percentage		Female Percentage		Total Percentage	
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
Saturday (morning)	7/23	45.7	54.3	43.8	56.2	44.6	55.4
Saturday (evening)	7/23	41.8	58.2	46.1	53.9	44.6	55.4
Sunday (morning)	7/24	55.0	45.0	72.3	27.7	65.6	34.4

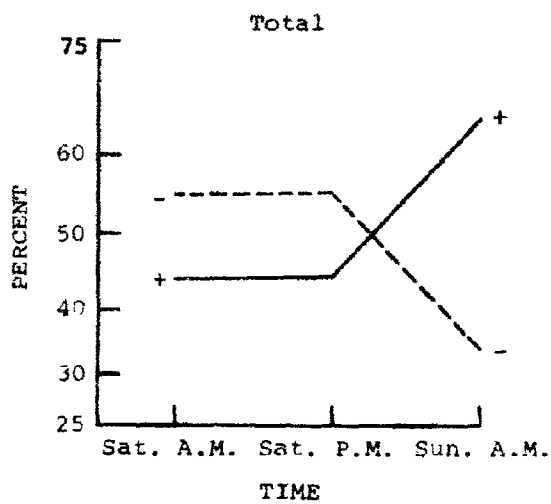
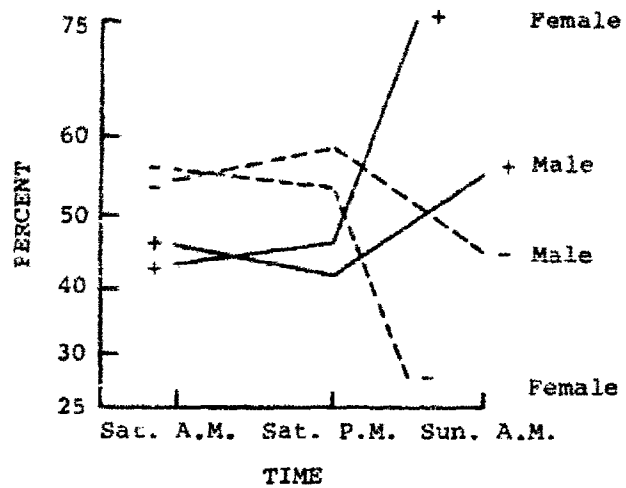


Figure 3. Percentage comparisons of frequencies of positive and negative responses on a 300 unstructured diary sample (ES X).

Table 45  
Unstructured Diaries--Positive Comments for  
Male and Female Shelterees  
(ES X)

Comment	Male		Female		Total	
	Freq.	Percent*	Freq.	Percent*	Freq.	Percent*
Generally positive	29	33.0	45	28.0	74	29.7
Other people	11	12.5	28	17.4	39	15.7
Experience	9	10.2	23	14.3	32	12.6
Sleeping	5	5.7	11	6.8	16	6.4
Things better	4	4.5	10	6.2	14	5.6
Organization	6	6.8	1	--	7	2.8
Staff	4	4.5	3	1.9	7	2.8
Candy	2	2.3	4	2.5	6	2.4
Food	1	--	5	3.1	6	2.4
Space	3	3.4	2	--	5	2.0
PVK	3	3.4	2	--	5	2.0
Crackers	2	2.3	--	--	2	--
Physical feeling	2	2.3	2	--	4	--
Total Scorable Comments = 88		Total Scorable Comments = 161		Total Scorable Comments = 249		

\*Only comments with a percentage of two or above are included. Percentages are computed for each column individually using the total scorable comments at the bottom as the base for computation.

Table 46

Unstructured Diaries--Negative Comments for  
Male and Female Shelterees  
(ES X)

Comment	Male		Female		Total	
	Freq.	Percent*	Freq.	Percent*	Freq.	Percent*
Space	22	22.7	29	20.7	51	21.5
Too hot	11	11.3	13	9.3	24	10.1
Physical feeling	6	6.2	15	10.7	21	8.9
Generally negative	6	6.2	6	4.3	12	5.1
Sleeping	3	3.1	9	6.4	12	5.1
Floor	3	3.1	6	4.3	9	3.8
Noise	3	3.1	6	4.3	9	3.8
Water	5	5.2	3	2.1	8	3.4
Organization	5	5.2	2	--	7	3.0
Boredom	1	--	4	2.9	5	2.1
Crackers	--	--	5	3.6	5	2.1
Food	4	4.1	1	--	5	2.1
Supplies brought in	3	3.1	1	--	4	--
Time	3	3.1	1	--	4	--
Sanitation	2	2.1	2	--	4	--
Staff	2	2.1	--	--	2	--
Too cold	2	2.1	1	--	3	--
Commode odor	1	--	3	2.1	4	--
Exercise	--	--	3	2.1	3	--
Hungry	1	--	3	2.1	4	--
Lack of bathing facilities	--	--	3	2.1	3	--
Things worse	1	--	3	2.1	4	--
Total Scorable Comments = 97    Total Scorable Comments = 140    Total Scorable Comments = 237						

\*Only comments with a percentage of two or more are included. Percentages are computed for each column individually using the total scorable comments at the bottom as the base for computation.

explanation for this fact is that the organization during the first six hours of confinement permitted inequitable space distribution, but as organization improved, space inequality ceased to be an issue. Of course, it is also possible that once having mentioned a complaint, the shelterees thought it unnecessary to repeat the complaint in later diaries.

ES X was consistent with the pattern of behavior of previous studies--shelterees tend to list fewer complaints, and more positive aspects, as confinement continues.

b. Food and Water

Items grouped in this category were candy, food, water, and the amount of food and water. Comments on hunger were also included. It was found that 8.4% of all positive comments and 11% of all negative comments pertained to food and water. According to remarks scored from the sample diaries, shelterees objected more to the water than any other item in this category. As in previous studies, day by day positive comments in this area decreased, and negative comments tended to increase.

c. Sleeping

Scored in the sleeping category were 6.4% of all positive comments and 5.1% of all negative comments. Remarks of "slept very well" appeared most frequently in the Sunday morning diaries. The remarkably low negative response in this category might be attributed to the tendency of shelterees to mention the crowded conditions (Space) rather than comment specifically on sleeping discomforts.

d. Activities

The PVK. organization, boredom, time, exercise, lectures, not enough activities, recreation, and Sunday service were items grouped in this category, and it was found that of the negative comments 11.4% were made concerning activities and of the positive comments, 9.6%.

It may be interesting to note that there were as many positive comments as negative comments made concerning organization. All but one negative comment appeared in the Saturday morning diaries, while positive comments on organization first appeared in the Saturday evening diaries and increased slightly on Sunday morning.

e. People

Shelterees' reactions to other shelter occupants were evaluated by combining comments on other people, cooperation, staff, and children. Positive comments were high (19.7% of all positive comments) and negative responses low (2.1%) in this category. It appears that although lack of space and the resultant lack of privacy presented many problems, shelterees maintained a high tolerance for each other. Of the forty-nine positive comments scored in this area, thirty-nine were in the category "other people".

f. Morale

Admittedly morale is intangible, but in an effort to synthesize the attitudes of the shelterees, the following categories were analyzed: Generally Positive, Generally Negative, Things Better, Things Worse, and Total Positives, Total Negatives. On Saturday morning 41% of the total negative comments and 31% of the total positive comments were made. However, on Sunday morning only 22% of the total negative comments were expressed in contrast with 41% of the total positive comments.

The fact that eleven of the fourteen comments in the category "things better" and no comments in the category "things worse" appeared in the Sunday diaries demonstrated once more the morale trend evidenced in earlier tests.

2. Post-Shelter Questionnaire

On the afternoon prior to emergence from the shelter, Post-Shelter Questionnaires were administered to shelterees ranging in age from thirteen to seventy-three years, resulting in ninety-seven male and one hundred and fifty-seven female questionnaires. Their evaluation of shelter life follows.

a. Adjustment to Shelter Living

In an effort to evaluate the shelterees' adjustment to shelter life, each was required to estimate the number of days he could remain in confinement under the same or comparable conditions. The average estimate for males was 9.3 days (median, 5.8 days) and for females 5.7 days (median, 4.0 days). The overall estimate was 7.2 days (median, 4.0 days). (See Table 47.)

Two additional questions indicated a favorable attitude on the part of the shelterees regarding their stay in the shelter. When asked if they would have volunteered to stay in

Table 47

Shelteree Estimates of Tolerance  
for Continued Confinement  
(ES X)

Additional Days	Male	Female	Total Group
0	21	45	66 (26.6%)
1	6	3	9 (3.6%)
2	7	13	20 (8.1%)
3	6	14	20 (8.1%)
4	3	6	9 (3.6%)
5	8	18	26 (10.5%)
6	1	3	4 (1.6%)
7	10	18	28 (11.7%)
8	1	0	1 (.4%)
9	0	4	4 (1.6%)
10	16	11	27 (10.9%)
15	0	3	3 (1.2%)
20	1	0	1 (.4%)
30	19	11	30 (12.1%)
Total Responses	99	149	248
Mean Estimate	9.3 days	5.7 days	7.2 days
Median Estimate	5.8 days	4.0 days	4.0 days

the shelter had they known what it would be like, 84.3% responded positively. Furthermore, 76.4% of those completing the form indicated that they would be willing to volunteer to stay in the shelter again. (See Table 48.)

Shelterees were presented with the opportunity to list any items which they felt should definitely be added to the shelter stocks. Suggestions most often made were improved sanitation supplies (22.4%), storage facilities (13.4%), more space (12.2%), bedding material (11.8%) and better and more varied foods (7.9%).

When asked what three items they would bring for another shelter stay, bedding was most frequently listed (by 68.9% of the shelterees responding). However, in answer to another question, 5.5% listed bedding as an article they brought with them which they could have done without. Food (58.7%) and liquids (45.7%) took second and third places respectively as items to be brought, whereas 21.7% had food and water not needed. Recreational materials (26.8%) ranked fourth on the list of items to be brought, but 15.0% named these as dispensable articles. Additional items shelterees indicated they would bring with them for another shelter stay may be found in Table 49.

#### b. Primary Discomfort Factors

Another section of the Post-Shelter Questionnaire was designed to reveal the factors contributing to discomforts incurred during the shelter stay. Shelterees were asked to choose from among seventeen listed items the ones they felt to be discomforts. Food was omitted from the list since a large number of shelterees provided their own, and presumably would bring desired items. The frequency of selection and the percentage of persons marking each choice is presented in Table 50. In order of frequency of mention the six major sources of discomfort were "no bathing," "toilets," "poor sleep conditions," "temperature," "smells," and "space." Almost one-third of the occupants also mentioned "boredom," "dirty," "no coffee," and "noise."

The lack of bathing facilities emerged as the greatest discomfort, being selected by 61.9% of the shelterees completing the questionnaire.

"Toilet" was placed second on the list of discomforts. That shelterees were bothered by the chemical commodes is evident in that 53.2% indicated this facility as a discomfort factor.

"Poor sleep conditions" emerged as the third greatest discomfort, being selected by 52.2% of the shelterees questioned.



Table 48  
Shelteree Evaluation of Shelter Adjustment  
(ES X)

Question	<u>Male</u>		<u>Female</u>		<u>Total Group</u>	
	Yes	No	Yes	No	Yes	No
Would you have volunteered to stay in the shelter if you had known what it would really be like?	79	18	135	21	214 (84.3%)	39
Would you volunteer to stay in this shelter again some-time?	75	21	119	38	194 (76.4%)	59

Table 49

Shelteree Indication of Items They Would Bring for Another  
Shelter Stay and Their Suggestions for Shelter Additions  
(ES X)

Item or Suggestion	Males (N=97)	Females (N=157)	Total (N=254)
<u>Would Bring:</u>			
Bedding	68	107	175 (68.9%)
Food	60	89	149 (58.7%)
Liquids	49	67	116 (45.7%)
Recreational items	37	31	68 (26.8%)
Change of clothing	8	35	43 (16.9%)
Toilet articles	10	28	38 (14.9%)
<u>Should Be Added:</u>			
Improved sanitation supplies	21	36	57 (22.4%)
Storage facilities	12	22	34 (13.4%)
More space	15	16	31 (12.2%)
Bedding material	12	18	30 (11.6%)
Better and more varied foods	4	16	20 (7.9%)

Table 50

Shelteree Indication of Discomfort  
(ES X)

Item	Item Frequency by Age Groups					Total Group (N=254)*
	8-16 (N=40)	17-23 (N=41)	24-30 (N=35)	31-40 (N=67)	41-50 (N=50)	51-70 (N=21)
No bathing	22	25	24	46	33	7
Toilets	29	23	21	35	21	6
Poor sleeping conditions	28	23	22	37	17	5
Too warm daytime temperature	17	23	23	32	25	8
Space	28	18	16	30	15	4
Smells	25	18	20	33	15	0
Boredom	19	19	11	21	10	1
Dirty	19	16	15	22	7	2
No coffee	7	6	11	26	25	5
Noise	17	13	10	24	11	3
Lack of fresh air	17	11	13	17	10	2
Tobacco smoke	15	8	6	10	9	0
Drinking water	10	11	3	13	4	2
Too warm nighttime temperature	8	4	7	16	2	4
Crackers	17	10	2	7	1	0
Too cool nighttime temperature	11	5	1	2	4	1
Too cool daytime temperature	0	1	2	0	1	0
						4

\*Number of persons ranking items. Several items can be ranked by one person.

Shelter temperature affected many shelterees adversely with 50.4% of those questioned listing "too warm daytime temperature" as a discomfort factor.

Although "space" received the highest number of negative comments in the shelter diaries, this category ranked in fifth place (43.7%, along with "smells") on the Post-Shelter Questionnaire. As noted in the report on diary analysis, shelterees were disturbed by the lack of space during early hours of confinement, but tended to make fewer complaints after the first diary distribution period, presumably because of adjustment to the crowded conditions.

#### c. Shelter Organization

Specific questions were posed in order to assess reaction to the organization of the shelter. In the opinion of 58.3% of the shelterees, the temporary phase of shelter operations was not organized sufficiently well. The situation was felt to have improved by the time the questionnaire was administered on Sunday afternoon, although 23.6% of the shelterees felt at that time that the shelter was still not efficiently organized.

The most common activities listed by the shelterees were "talking" (55.1%), "just lying around" (52.8%), "looking after family" (46.9%), "reading" (33.5%), "playing cards" (23.6%), and "helping to operate the shelter" (16%).

#### E. Defections

Eighty-seven shelterees left the shelter before the scheduled exit time (thirty-seven males and fifty females). However, since twenty-eight persons left because of necessity to accompany others, e.g., children leaving with defecting parents, the actual number of defections is fifty-nine, or approximately 12%. Eighteen families accounted for sixty-seven defections and the remainder consisted of four childless married couples and twelve individuals. Although the shelter population was approximately 13% Negro, all defectors were white. The age range of defectors was from one-seventy with a mean age of twenty-two years.

The possibility that contest recruited shelterees (222 out of 504) were given a "cosy" picture of shelter conditions, and consequently defected because of subsequent disappointment, was examined. The fact that only twenty-six of eighty-seven defections were contest recruited, a similar ratio, refutes this hypothesis. Furthermore, only twenty-three of the fifty-two defections answering the Pre-Shelter Questionnaire question, "Before today have you talked with anyone who has ever been in

a University of Georgia study like this one?", responded in the affirmative, whereas this question was similarly answered by one hundred and thirty out of two hundred and eighty-five respondents. Previous contact was therefore also considered not to be a factor contributing significantly to the defection rate.

The ES VIII finding that shelterees who stayed had experienced a greater number of family problems was not replicated in ES X.

Nine persons claimed medical problems for early exit of which only eight were listed as such by the in-shelter physician. Seventy-eight were categorized as psychological defections. Reasons given for early exit are shown in Table 51.

It may be noted from Table 52, which lists approximate time of defection and the defector's former place in the shelter, that 51.7% of all defections were from the large downstairs room (Room C) during the first six hours of confinement. A total of fifty-nine defectors left the shelter during this period--the reasons given most frequently were "too crowded" and "too hot."

An interesting point in regard to defections concerns personal possessions brought by shelterees, discussed elsewhere in this report. Fewer defectors brought bedding and food, and yet defectors brought twice as many games as did shelterees who stayed. This fact reflects on the preparedness, as well as the attitude, of shelterees who defected.

In summary, several factors may have contributed to the high defection rate on the day of entry:

1. Handbook instructions concerning the completion of Information Cards were misunderstood by a member of the temporary shelter staff, and occupants were not delegated space in other sections of the shelter but remained in Room C, causing extreme overcrowding (approximately 6.7 sq. ft./person) in that area during the temporary phase.
2. Organizational problems during the temporary phase, which delayed the formulation of a permanent shelter staff, caused confusion and subsequent dissatisfaction among many shelterees who, possibly believing that the situation would not improve, did not choose to remain.
3. Pre-processing procedures were lengthy (five to six hours, including transportation from the processing

Table 51  
Reasons Given by Defectors for Early Exit  
(ES X)

Reason*	Frequency
Too crowded	41
To accompany others defecting	28
Uncomfortable temperature and humidity, and poor ventilation	24
Food and water	22
Too noisy	13
No sleep	11
Poor management	10
Floor too hard	10
Fatigue and boredom	10
Commode and general sanitation	8
Uncooperative shelterees	7
Headache	4
Backache	3
Ear infection	3
Sick	3
Didn't like it	3
Diarrhea	2
Pregnancy discomforts	2
Nervous	2
Eye infection	1
Others' smoking	1
Would miss Sunday School	1

\*Several reasons were given by individual shelterees;  
nineteen shelterees made no comment.

Table 52  
Approximate Time of Defection and Defector's  
Former Place in Shelter  
(ES X)

Approximate Time of Defection	Room <sup>a</sup>					Total
	A	B	C	D	E	
Friday (22 July) Time of entry to midnight	-	9	45	5	-	59
Saturday (23 July) 8 A.M. to noon	-	1	2	9	-	12
Noon to midnight	-	-	11	-	-	11
Sunday (24 July) 8 A.M. to noon	5	-	-	-	-	5
Total	5	10	58	14	0	87

<sup>a</sup>See map of shelter area.

area to the shelter) and shelterees became uncomfortable and impatient before entering the shelter. Also, many shelterees arrived for processing several hours before the scheduled time.

4. In terms of personal possessions brought with them, defectors were less prepared than shelterees who stayed, and perhaps viewed the experiment less seriously than those who stayed.
5. Defectors may have expected more shelter provisions to meet their needs, and realization of this incorrect assumption may have caused disappointment and contributed to defection tendency.

Throughout the confinement period, discomforts attributed to lack of space remained among the most frequently listed reasons for early exit.

## V. Environmental Variables

### A. Space

The fallout shelter used for ES X was located in a building in the downtown area of the city of Athens, Georgia. The experimental shelter area, above ground on the first and second floors of the building, was designed to accommodate five hundred shelterees, allowing 8.0 sq. ft. of floor space per person, including supply storage. The first floor area consisted of about 2450 sq. ft., and the second floor of about 1550 sq. ft. (Figure 4).

Since space was an experimental variable, Room B with approximately 351 sq. ft. was closed off after forty-four defectors left the shelter to keep constant the 8.0 sq. ft. of floor space per person. Other rooms would have been closed off as certain accumulative numbers of defections occurred, but no further space reduction was thereby implemented. Although 8.0 sq. ft./person was intended, inequitable space management in the temporary phase resulted in approximately 6.7 sq. ft./person in Room C, the largest room of the shelter.





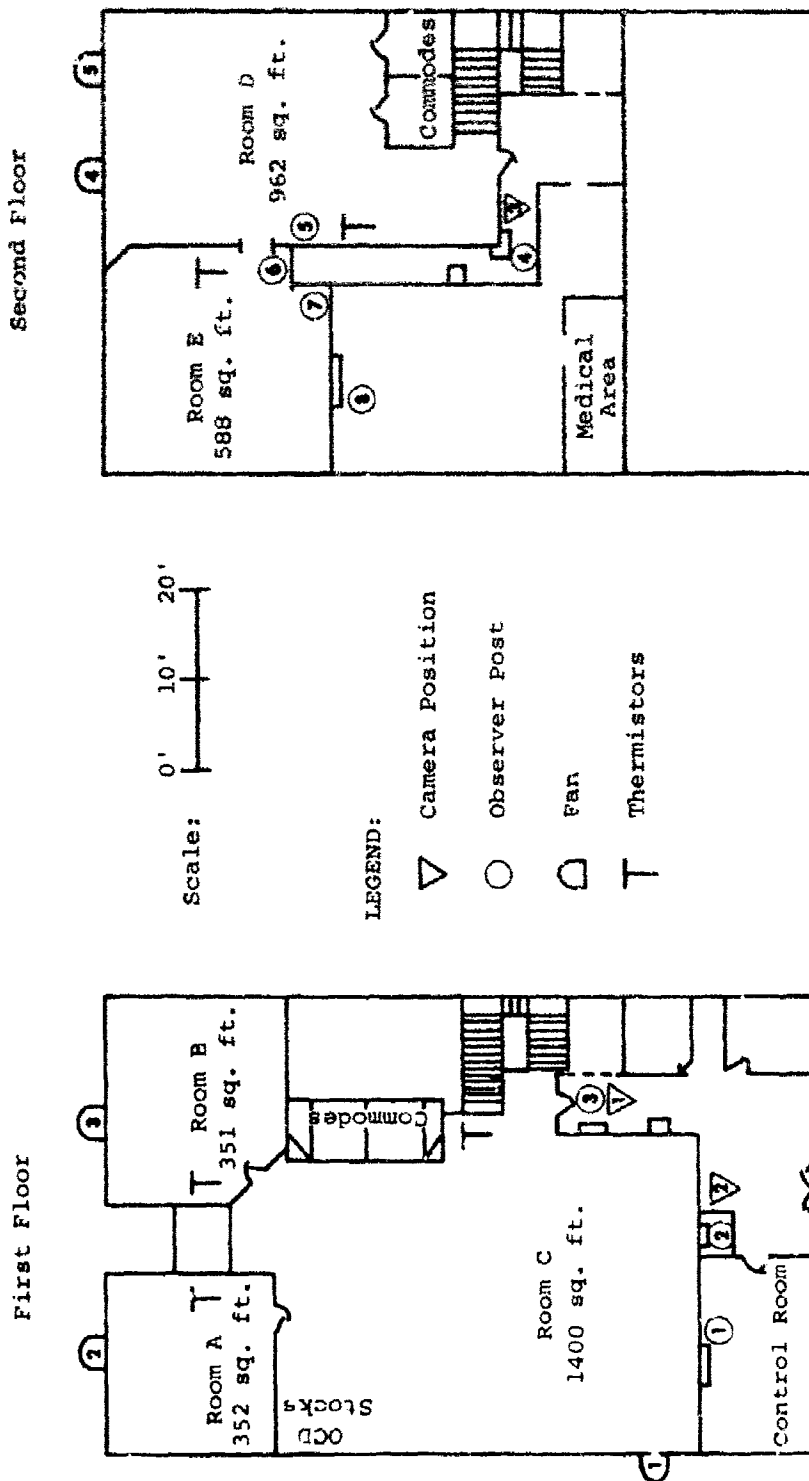


Figure 4. The 500-Person Shelter (ES X).

With the exception of the floor of Room A, of wood construction, all the floors were concrete. The ceiling on the first floor was 12.5 ft. high, the ceiling on the second floor 10 ft. high.

The control room was situated at the rear of the building on the first floor, occupying about 280 sq. ft. (20' x 14'). The controls for the various recording instruments were located in this room.

#### B. Temperature and Ventilation

Temperature measurements were taken, using thermistors in the shelter area and a sling psychrometer outside the shelter area.

During ES X, the overall mean outside dry bulb temperature (computed from the sling psychrometer readings) was 77.4°F, with a maximum dry bulb temperature of 90.5°F on 24 July and a minimum dry bulb temperature of 62.3°F on 24 July. The overall mean shelter area dry bulb temperature (computed on thermistor readings) was 79.9°F, with a maximum dry bulb temperature of 88.0°F on 22 July and a minimum dry bulb temperature of 68.5°F on 24 July.

The overall mean outside Temperature-Humidity Index (THI) was 71.8°F, with a maximum index of 79.9°F on 22 July and a minimum index of 60.3°F on 24 July. The overall mean shelter area THI was 75.4°F, with a maximum index of 81.8°F on 22 July and a minimum index of 68.2°F on 24 July.

During the study, the shelter area dry bulb temperature was lower than the outside dry bulb temperature from about 11:00 A.M. to 7:00 P.M. each day, and greater than the outside dry bulb temperature during the nighttime hours and early morning hours. The THI also followed this trend each day (see Table 53).

Eight fans were used for ventilation in ES X. Three were exhaust fans only and were located in the observation areas outside the shelter. Five of the fans were intake fans only and were located in the shelter area. The capacities and characteristics of the fans are shown in Table 54, and ventilation characteristics can be found in Table 55.

For a description of the ventilation equipment used, refer to the table on fan characteristics and to the section on the Packaged Ventilation Kit. A ventilation log (Table 56) shows the use of the ventilation equipment during the study.

#### C. Noise and Lighting

Noise level readings in the shelter area were recorded in decibels during daylight hours on a General Radio Company Type 1565-A

Table 53  
Temperature-Humidity Index (THI) Readings  
(ES X)

Location Of Reading	Instrument Used	THI				THI			
		Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
		(5:00 P.M. July 22 to 5:00 A.M. July 23)				(5:01 A.M. to 5:00 P.M. July 23)			
Outside	Sling Psychrometer	79.9	66.2	71.6	70.6	77.8	65.3	73.3	74.6
Room A	Thermistor	79.4	73.0	76.0	76.4	77.8	72.4	75.7	76.4
Room B	Thermistor	78.6	73.4	76.2	76.4	75.7	72.4	74.7	75.2
Room C	Thermistor	81.0	74.1	77.5	76.8	78.2	75.4	77.0	77.3
Room D	Thermistor	81.8	71.8	75.6	75.6	75.3	71.4	74.0	74.8
Room E	Thermistor	80.2	69.8	74.5	75.2	76.5	68.9	73.9	75.1
		(5:01 P.M. July 23 to 5:00 A.M. July 24)				(5:01 A.M. to 5:00 P.M. July 24)			
Outside	Sling Psychrometer	75.0	63.2	68.3	66.9	79.7	60.3	74.1	75.6
Room A	Thermistor	77.7	73.2	75.3	74.9	78.4	71.6	76.3	77.2
Room B	Thermistor	75.4	73.5	74.5	74.7	77.2	72.6	74.9	75.2
Room C	Thermistor	77.9	75.6	76.6	76.1	78.9	74.8	77.5	77.8
Room D	Thermistor	75.2	71.0	73.5	74.8	78.1	70.0	75.2	75.8
Room E	Thermistor	76.9	68.3	72.9	72.5	81.6	68.2	75.8	77.1

Table 54  
Ventilation Fan Characteristics  
(ES X)

Quantity	Size	Type	"0" Static Capacity (CFM)	Total CFM
5	20"	Window	4,000	20,000
1	24"	Attic	5,400	5,400
1	30"	Attic	7,800	7,800
1	42"	Attic	12,000	12,000
		Total		45,200
		Less 10% (static pressure and drag)		4,520
		Effective Total		40,680

Table 55

Ventilation Conditions  
(ES X)

Condition	Condition Description	Operation
1	3 Exhaust fans (first, second, and fourth floors)	On
	5 Intake fans (Rooms A, B, C, and D)	On
2	1 Exhaust fan (fourth floor)	On
	2 Exhaust fans (first and second floor)	Off
	2 Intake fans (Room D)	On
	3 Intake fans (Rooms A, B, and C)	Off
3	1 Exhaust fan (fourth floor)	Off
	2 Exhaust fans (first and second floors)	Off
	2 Intake fans (Room D)	On
	3 Intake fans (Rooms A, B, and C)	Off
4	2 Exhaust fans (first and fourth floors)	On
	1 Exhaust fan (second floor)	Off
	2 Intake fans (Room D)	On
	3 Intake fans (Rooms A, B, and C)	Off
5	2 Exhaust fans (first and fourth floors)	On
	1 Exhaust fan (second floor)	Off
	5 Intake fans (Rooms A, B, C, and D)	Off
6	3 Exhaust fans (first, second, and fourth floors)	On
	5 Intake fans (Rooms A, B, C, and D)	Off
7	3 Exhaust fans (first, second, and fourth floors)	Off
	5 Intake fans (Rooms A, B, C, and D)	Off
8	Packaged Ventilation Kits (Room C and Room D)	On

Table 56  
Ventilation Log  
(ES X)

Time	Condition	Time	Condition
<u>Friday</u>		<u>(Saturday, Contd.)</u>	
5:00-6:00 P.M.	7	5:00-6:00 P.M.	5,8
6:00-7:00	7	6:00-7:00	5,8
7:00-8:00	7	7:00-8:00	5,8
8:00-9:00	7,5 <sup>a</sup>	8:00-9:00	5,8
9:00-10:00	5,8	9:00-10:00	5,8
10:00-11:00	5,8	10:00-11:00	5,8
11:00-12:00 Midnight	5,8	11:00-12:00 Midnight	5
<u>Saturday</u>		<u>Sunday</u>	
12:00-1:00 A.M.	5,8	12:00-1:00 A.M.	5
1:00-2:00	5,8	1:00-2:00	5
2:00-3:00	5,8	2:00-3:00	5
3:00-4:00	5,8	3:00-4:00	5
4:00-5:00	5,8	4:00-5:00	5
5:00-6:00	5,8	5:00-6:00	5
6:00-7:00	5,8	6:00-7:00	5
7:00-8:00	5,8	7:00-8:00	5
8:00-9:00	5,8	8:00-9:00	5
9:00-10:00	5,8	9:00-10:00	5
10:00-11:00	5,8	10:00-11:00	5
11:00-12:00	5,8	11:00-12:00	5
12:00-1:00 P.M.	5,8	12:00-1:00 P.M.	5
1:00-2:00	5,8	1:00-2:00	5,8
2:00-3:00	5,8	2:00-3:00	5,8
3:00-4:00	5,8	3:00-4:00	5,8
4:00-5:00	5,8	4:00-5:00	5,8
(Contd.)		5:00-6:00	5,8

<sup>a</sup>From Condition 7 to Condition 5 at 8:05 P.M.

sound-level meter. Illumination readings in the shelter area were recorded on a Weston Model 759 foot-lambert meter.

During the study, the overall mean noise level was 73.2 decibels, with a maximum of 85 decibels on 23 July and a minimum of 64 decibels on 24 July (see Table 57). These readings were taken with a weighting characteristic of "A" which discriminates heavily against low frequency sounds, and therefore gives an indication closely correlated with subjective estimates of loudness, annoyance, and speech interference.

The noise level of several familiar sounds are: normal conversation--60 decibels; quiet office--40 decibels; noisy automobile--80 decibels; painful sound--130 decibels. The overall mean noise level of 73.2 decibels was within the range of normal conversation to a noisy automobile. The relation of noise level to occurrence of headache is discussed under the medical complaints section of this report.

Lighting was provided by sixteen fluorescent ceiling lights, each approximately 170 watts. Night lighting was furnished by several 15-watt lamps in the shelter area. Camera lighting was furnished by thirty-seven 200-watt incandescent bulbs, for use only during filming.

During the study, the overall mean illumination was 5.9 foot-lamberts, with a maximum of 46.5 foot-lamberts on 24 July, and a minimum of 0.0 foot-lamberts on 23 July and 24 July. Illumination readings were taken only during daylight hours of the study. Consequently, no readings are given for Friday, 22 July (see Table 58).

#### D. Shelter Supplies

The shelter for ES X was stocked in accordance with OCD specifications (see Table 59). In addition there was one CDV-715 radiological meter supplied for use in the EOC program, four fire extinguishers, one Bible, one mop, one broom, one Shelter Handbook, two Packaged Ventilation Kits, one supplementary medical kit (see Tables 59, 61, and 62). The purpose for including the PVKs was to assess shelteree understanding of the assembly and operation of these units. No ventilation engineering test was to be conducted.

##### 1. Inventory of Shelter Supplies

An inventory of expended shelter supplies is presented in Tables 59, 61, and 62. Based on a two-week stay, the amount of supply usage should not have exceeded 14%.

##### 2. Sanitation Kit IV

Ten OCD supplied Sanitation Kit IV (SK IV) were stocked in the shelter for ES X. Each kit contained one fiber drum, ten

Table 57

Noise Level Readings in Decibels  
(ES X)

Location of Reading <sup>a</sup>	23 July			24 July				
	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median
Room A	77.0	66.0	69.6	69.0	77.0	64.0	70.1	70.0
Room B	77.0	65.0	70.0	70.0	77.0	64.0	70.1	70.0
Room C	79.0	69.0	74.5	74.0	83.0	68.0	75.9	76.5
Room D	78.0	69.0	74.4	74.0	82.0	67.0	75.4	75.0
Room E	85.0	69.0	74.2	74.0	79.0	69.0	74.9	75.0

<sup>a</sup>On the noise level meter

<sup>a</sup>On the noise level meter.<sup>b</sup>Room B was evacuated at 11:00 A.M.



Table 58  
Illumination Readings in Foot-Lamberts  
(ES X)

Location of Reading <sup>a</sup>	23 July			24 July		
	Max.	Min.	Mean	Max.	Min.	Mean
Room A	18.0	0.1	7.5	38.0	2.0	11.9
Room B	13.0	1.0	4.7	--- <sup>b</sup>	---	---
Room C	13.0	0.0	4.7	45.0	0.0	7.0
Room D	18.0	0.0	4.8	12.0	0.0	4.0
Room E	9.0	0.0	3.3	46.5	0.2	5.1

<sup>a</sup>On foot-lambert meter.

<sup>b</sup>Room B was evacuated at 11:00 A.M.

Table 59  
OCD Shelter Provisions  
(ES X)

Item <sup>a</sup>	Stocked	Used	Unused
Crackers (2 tins/box; 14.5 lbs./tin)			
boxes	58	6.3	51.7
lbs.	1682	181.5	1500.5
Carbohydrate Supplement (2 tins/box; 35 lbs./tin)			
boxes	13	1	12
lbs.	910	72.1	837.9
Water (17.5 gals./drum)			
drums	100 <sup>b</sup>	60 empty 60 <sup>b</sup>	0
gals.	700	40 full 17.2	22.2
		311.2	388.8
Radiological Kit	1	1	0
Extra Radiological Meters	1	1	0
Sanitation Kit IV	10		
Toilet Tissue (10 rolls ea.)	100	29.8	70.2
Drum, fiber (1 ea.)	10	2	8
Commode seat (1 ea.)	10	8	2
Can Opener (1 ea.)	10	8	2
Sanitary Napkins (60 ea.)	600	125	475
Gloves, polyethylene (1 pair ea.)	10	9	1
Spout (siphon hose)-5 ft. 1/2 in. (1 ea.)	6	5	1
-4 ft. (1 ea.)	4	1	3
Tie Wire (1 ea.)	10	10	0
Cups, paper (80 ea.)	800	794	6
Cup Lids, plastic (80 ea.)	800	620	180
Bag, polyethylene (1 ea.)	10	5	5
Commode Chemical:			
Timsen - Control -- <sup>c</sup>			
Acid Chemical - Experimental -- <sup>c</sup>			
Instruction Sheet (1 ea.)	10	7	3
Fan, Packaged Ventilation Kit			
Unit A-Fan Assembly			
115 Volt A.C. Motor, 20 inch fan	2	2	0
Unit B-Drive Module	2	2	0
Additional Supplies:			
Fire Extinguishers	4	0	4
Bible	1	1	0
Mops	1	1	0
Brooms	1	1	0
Shelter Handbook	1	1	0

<sup>a</sup>OCD Medical Kit and supplementary items are presented in other tables.

<sup>b</sup>These drums were used for trash containers with the exception of four which were used by shelterees to set up commodes initially.

<sup>c</sup>This item not stocked but controlled for experimental testing.

rolls of toilet tissue, one commode seat, one can opener, five dozen sanitary napkins, one pair of polyethylene gloves, a tie wire, one double-liner polyethylene bag, eighty plastic cups with lids, one spout (siphon hose--of the ten stocked, six were 5 ft. 1/2 in., and four were 4 ft. long), and one instruction sheet. The commode chemicals were removed from each kit and controlled for experimental testing.

Only one fiber board drum was used as a commode, and this incident occurred during the temporary phase. The experimentally programmed commode testing utilized empty water drums. Thirteen female and eight male commodes were sealed off.

Toilet tissue was used excessively, 30% of the two-week supply being utilized in the two days. Other excessively consumed items included sanitary napkins (25% of supply), and paper cups (794 of 800 provided, exclusive of the 48 paper cups used from the CDR supplementary medical kit items).

### 3. Commode Chemical Test

The experimental design for ES X included a comparison test of commode chemicals (see Table 60). The two chemicals to be compared via a rating system were Timsen (alkyl dimethylbenzyl ammonium chlorides and urea), and Experimental (sodium bisulfate and cupric sulfate pentahydrate). Each was to be used in strict compliance with printed instructions specific to each.

The start of the commode chemical test was scheduled for the beginning of the permanent phase, after the temporary staff was allowed to set up initial commodes in accordance with Handbook instructions.

All commodes to be used in the test were to be installed by CDR staff to ensure compliance with instructions. Eight commodes were in use at any given time, (4 upstairs, 2 male and 2 female; and 4 downstairs, 2 male and 2 female). Each pair of commodes in a particular commode area was to be considered a unit, such that when one commode in an area was judged full, both were closed off and replaced at the same time. Sequence of the two respective chemicals was counterbalanced. Commodes were considered full when 3/4 of the drum was filled. Raters were to be six pre-selected CDR staff members and six selected shelteree staff members, each staff team to be composed of three men and three women.

In spite of the planned experimental design, the commode comparison test was nullified in its early stages, due to shelteree use of an aerosol can of room deodorant and perfume in a female commode area, and males utilizing separate commodes for separate physiological functions.

Table 60

Commode Chemical Test  
(ES X)

Drum Type and Number	Location				Sealed Off		Filled Volume
	First Floor		Second Floor		Date	Time	
	M	F	M	F			
Metal		T <sup>a</sup>			7/22	9:45 P.M.	1/4
Metal		E	T		7/22	10:00 P.M.	1/4
Metal 103					7/23	2:30 P.M.	2/3
Fiberboard	E <sup>b</sup>				7/23	3:30 P.M.	1/4
Metal 104		E			7/23	3:30 P.M.	2/3
Metal 113				E	7/23	4:15 P.M.	1/4
Metal 114				T	7/23	4:15 P.M.	1/2
Metal 115			E		7/23	10:15 P.M.	1/4
Metal 116			E		7/23	10:15 P.M.	1/2
Metal 119				T	7/24	12:00 Noon	1/2
Metal 120				E	7/24	12:00 Noon	2/3
Metal 105		T			7/24	1:05 P.M.	2/3
Metal 106		T			7/24	1:05 P.M.	2/3
Metal 107	T				7/24	6:20 P.M.	1/3
Metal 108		E			7/24	6:20 P.M.	1/4
Metal 109	T				7/24	6:20 P.M.	1/4
Metal 110		E			7/24	6:30 P.M.	1/4
Metal 117			T		7/24	6:30 P.M.	1/4
Metal 118			T		7/24	6:30 P.M.	1/4
Metal 121				E	7/24	6:40 P.M.	1/4
Metal 122				T	7/24	6:45 P.M.	1/4

<sup>a</sup>Timsen chemical.<sup>b</sup>Experimental chemical.



#### 4. Packaged Ventilation Kit

Two Packaged Ventilation Kits were used in ES X. A temporary staff member was to set up the kits. Temporary Ventilation Officer's Handbook leaflet instructed this staff member to utilize the packaged instructions for assembly, operation, and maintenance. Permanent phase obligations for operation and maintenance were delegated to the Director of Supply and Maintenance.

At 5:44 P.M., approximately four minutes after entry, the Temporary Ventilation Officer was selected. The kit modules

were located at 6:06 P.M., and two assistants selected by the Temporary Ventilation Officer began assembly. The two unit A packages were opened first and plugged in immediately for use as circulating fans. The drive module container was then opened, but the bicycle apparatus confused the Temporary Ventilation Officer and his assistants, who had not yet read the instructions. The fan assembly up to this point was being used only to circulate air in the shelter. Instructions were read at about 6:25 P.M. and a decision made to keep the fan on electrical operation. The fan was elevated by placing it upon various boxes, including its own container, to keep it out of reach of children's hands. Finally it was placed on top of OCD water drums. At 7:00 P.M. one fan assembly was mounted on the module stand and moved into the large downstairs room. The second fan assembly was moved upstairs and remained on the floor. Duct work on the downstairs fan was over the shelter observation wall, but collapsing duct work, e.g., right angle bends and improper suspension, caused the unit to be ineffective. At 8:30 P.M. the assembly was moved to the ceiling of the commode area, approximately 8.5 ft. above the floor. This action solved several problems: (1) the duct work could be run without an angle necessary and could be suspended between the wall and ceiling, (2) hot air closer to the ceiling was vented off, making the fan more effective, (3) more floor space was made available, and (4) the assembly was out of the reach of children.

The upstairs fan assembly was fixed to the module stand and taped to the tops of water drums stacked two deep. There was noticeably more vibration in the duct work using this method, possibly due to the angle in the duct which was necessary in order to route it over the observation wall.

When manual operation was necessitated by a programmed electrical failure, the modules were placed on the floor and prepared for manual operation. The PVK used downstairs was operable within five minutes, but difficulty with the chain tension was experienced with the upstairs module. When inserted, the locking pins created too much tension on the chain, and when they were not inserted, the chain slipped. Finally, the chain was forced on and operation soon stretched the chain enough for proper tension. There was concern about manual operation being made more difficult due to the inability to disconnect the motor completely from the shaft, although the permanent-split capacitor motor was selected for purposes of least drag.

Young adults and children formed lines and began to operate the apparatus. There was no need to ask for additional volunteers as lines were maintained. Many persons returned to the end of the line as soon as their turn was over.

Operators ranged in age from 6 to 40, with a mean age of 11.8 years. Individual operation duration ranged from 45 seconds to 22 minutes, with a mean time of 5.3 minutes. The "record" of 22 minutes was established by an 11-year-old female. Several other shelterees maintained operation satisfactorily for periods of time over 15 minutes. The operation of the PVKs was suspended at night, due to lack of volunteers, the noise level, and a comfortable temperature. Operation was resumed in the morning.

A recurring problem during manual operation was the inability to tighten the pedals with the wrench provided. Unless carefully checked the pedals would begin to work loose, eventually stripping the threads on the pedal or snapping the bolt off inside the sprocket arm. The same difficulty was noted with the seat bolt. The seat would begin to slip and turn, making it more difficult to pedal while seated. This problem was resolved by lowering the seat as far as possible and tightening the bolt frequently. The wrench was considered in all instances to fit improperly and to be too short. Recommendations for the PVK apparatus include a smaller mesh screen on the fan housing to prevent children from injuring their fingers, an anti-back-pedaling device to preclude suction of the duct work into the fan blades, and lock-type nuts on all the bolts to prevent their working loose. Also recommended is a method of adjusting chain tension to allow closer tolerances in order to prevent slippage and to allow for slack induced in the chain by use.

It is suggested that the instructions include a statement that the motor is designed to eliminate as much drag as possible and should not be removed during manual operation. Also, the wrench pictured should be similar to the one stocked in the kit. Lubrication instructions should be given for various periods of use.

#### 5. Medical Kit C

Two OCD Medical Kits C, each designed to supply the medical needs of 300-325 shelter occupants for a two-week period, were stocked. In addition to Medical Kit C, a CDR supplementary medical kit was supplied, based on recommendations from in-shelter physicians of past experimental studies.

A list of contents and an inventory of the supplies in both Medical Kit C and the supplementary medical kit are presented in Tables 61 and 62.

Eye and nose drops were the only items overused in Medical Kits C, twenty-two percent of the two-week supply being consumed. Five and one-fourth percent of the two-week supply of aspirin and one-half of one percent of the supply of phenobarbital tablets were used during ES X.

Table 61  
Medical Kit Provisions  
(ES X)

Item <sup>a</sup>	Stocked <sup>b</sup>	Used	Unused
Applicator, wood, cotton tipped end $\frac{1}{2}$ " x 6"/100s	1200 applicators	13	1187
Aspirin 5 gr/1000s	6000 tabs.	315	5685
Bandage, gauze, 2" x 6 yds./12s	12 boxes	.6	11.4
Bandage, muslin, compressed, camouflaged 37" x 37" x 52"	12 units	0	12
Cascara Sagrada Extract 4 gr/100s	12 btls.	0	12
Cotton, purified 1 lb.	6 pkgs.	.2	5.8
Depressor, tongue, wood 100s	600 depressors	12	588
Eugenol 1 oz.	2 btls.	.3	1.7
Eye, nosedrops $\frac{1}{2}$ oz.	36 pkgs.	8	28
Forceps, dressing $3\frac{1}{2}$ "	2	0	2
Isopropyl Alcohol	12 cans	1.5	10.5
Kaolin and Pectin Mixture 1 pt.	32 btls.	2	30
Pad, gauze, surgical 4" x 4"/200s	12 pkgs.	1	11
Penicillin G Tablets, 250,000 Units/100s	24 btls.	2 <sup>c</sup>	22
Petrolatum, white 1 lb.	6 cans	.1	5.9
Phenobarbital Tablets $\frac{1}{2}$ gr/1000s	6000 tabs.	33	5967
Pin, safety $1\frac{1}{2}$ "/12s	24 pkgs.	3.3	20.7
Publication: Medical Care in Shelters	2	1	1
Scissors	6 pr.	2	4
Soap, surgical $1\frac{1}{2}$ oz.	72 cakes	1	71
Sodium, bicarbonate 1 lb.	4 btls.	.1	3.9
Sodium, chloride 1 lb.	4 btls.	.1	3.9
Sulfadiazine Tablets $7\frac{1}{2}$ gr/1000s	6 btls.	0	6
Syringe, fountain	2	0	2
Thermometer, clinical, human, oral or rectal	8	4	4
Water Purification Tablets, iodine 8 mg.	24 btls.	3.2	20.8

<sup>a</sup>Also see Medical Kit Supplements.

<sup>b</sup>Two complete Medical Kits stocked.

<sup>c</sup>Usage of these pills is not completely accounted for due to the physicians' not having logged the number of pills prescribed.



Table 62

CDR Supplements to Medical Kit C  
(ES X)

Item	Stocked	Used	Unused
Adhesive Tape, 2" x 5 yds.	1 roll	.5	.5
Adhesive Tape, 1/2" x 10 yds.	3 rolls	.1	2.9
Ammonia, aromatic 12s	1 box	.2	.8
Analgesics (Morphine), 30 cc. 16.2 mg./cc., multidose vial <sup>a</sup>	1 vial	0	1
Antiemetic (Dramamine) 12s	1 box	0	1
Antihistamine			
-Benadryl, 25 mg./50s	1 btl.	0	1
-Benadryl, elixir 4 oz.	4 btls.	1.2	2.8
Antiseptic (Aqueous Zephiran) 8 oz. 1:750 <sup>b</sup>	1 btl.	.4	.6
Antispasmodic (Ephedrine Injection) vial, 1 oz., 1:1000 <sup>b</sup>	1 vial	0	1
Artificial Respiration Tube	2 (adult)	0	2
	2 (child)	0	2
	3 boxes	2	1
	1	0	1
Band-Aids, 56 assorted			
Basin, plastic <sup>b</sup>			
Burn Medication (Furacine Soluble Dressing), 28 gms.	3 tubes	1	2
Cot, aluminum folding	1	1	0
Cough Medication			
-Benylin Expectorant 4 oz.	6 btls.	.2	5.8
-Sudafed 4 oz. <sup>b</sup>	8 btls.	1.2	6.8
Cups, paper folding, medicine, 1 oz. <sup>b</sup>	100 cups	48	52
Forceps, small tip	1	0	1
IV Tubing (Solution Administration set) 20 g. x 1 (1/4"), vein needle <sup>a,b</sup>	3 sets	0	3
Notebook, looseleaf	1	1	0
Oxygen, unit <sup>a</sup>	1	0	1
Plasma			
-Dextran 6% w/v in Dextrose 5%, 500 ml. <sup>a</sup>	1 btl.	0	1
-Dextrose 5% in H <sub>2</sub> O, 1000 ml. <sup>a</sup>	1 btl.	0	1
-Sodium Chloride Injection, 1000 ml. <sup>a</sup>	1 btl.	0	1
Powdered Milk	1 pkq.	1	0
Salt 1000s	.5 btls.	0	.5
Sedative (Phenobarbital, Sodium) 12s <sup>a,b</sup>	2 pkqs.	0	2
Stimulant (Ephedrine Sulphate Injection) 1 ml./12s <sup>a</sup>	2 pkqs.	0	2
Storable Light (flashlight + 2 batteries) <sup>b</sup>	1	0	1
String, 250 ft.	1 roll	0	1
Sugar, cubed, 1 lb.	1 box	0	1
Syringe, plastic. 2 1/2 cc., 25 g. <sup>a</sup>	15	0	15
	6	0	6
	3	0	3
Thermometer, oral	2	0	2
Thermometer Container, plastic <sup>b</sup>	1	0	1
Tourniquet <sup>a,b</sup>	1	0	1
Toweling, paper <sup>b</sup>	1 roll	.5	.5

<sup>a</sup>Available in an emergency medical room on the second floor of the building outside the shelter area.

<sup>b</sup>Additions for ES X not stocked in ES IX.

With regard to the CDR supplementary medical kit, almost half of the antiseptic, adhesive tape, paper medical cups, anti-histamine, and paper towels were used. Sixty-seven percent of the two-week supply of assorted Band-Aids, and thirty-three percent of the two-week supply of burn medication were used, as well as the entire package of powdered milk. (See Table 62.)

A summary of the medical complaints registered with the medical teams and the post-shelter comments of the physicians and registered nurses who assisted in ES X are presented in another section of this report.

#### 6. Food and Water

The shelterees consumed an average of 413.7 calories crackers/person/day and 153.9 calories carbohydrate supplement/person/day of OCD stocks. They were allowed to bring food adjuncts to the shelter, and for this reason it is impossible to compute the total caloric intake.

The shelterees consumed the stocked water supply at an average rate of 1.4 quarts/person/day (see Table 63); however, many of them brought water into the shelter.

Eleven percent of the two-week supply of crackers was used, an amount about 3% below that allotted, and 8% of the two-week supply of carbohydrate supplement was used, a figure about 6% below that allotted. There were several reasons why the allotted food was not consumed: (1) the shelterees were allowed to bring food adjuncts into the shelter, and (2) defections occurred, reducing the demand on OCD stocks.

#### 7. CDR Supplies

The provision of one broom and one mop for the five hundred shelterees appeared satisfactory for the weekend test, but probably a greater number of such items will be needed for a two-week stay.

#### 8. Shelteree Personal Possessions

The Possession Inquiry Form was analyzed to obtain information regarding the total shelter population, the people who stayed for the duration of the study, and the people who defected during the study. The percentage of people bringing specific items into the shelter is differentiated from the list denoting the frequency with which a specific item was brought. Four hundred and twenty-six Possession Inquiry Forms were used, giving a total sample size of four hundred and twenty-six. Of the four hundred and twenty-six shelterees who completed the

Table 63  
Average Food and Water Consumption  
of OCD Stocks  
(ES X)

Item	Consumed	Consumed/Person/ Day*
Crackers	181.5 pounds	0.2 pounds 413.7 calories
Carbohydrate Supplement	72.1 pounds	0.1 pounds 153.9 calories
Water	1,244.6 quarts	1.4 quarts

\*Shelterees were permitted to bring personal food supplies. Consequently, total caloric intake is unknown. Data here are approximate, in view of continuous defections. An N of 445 shelterees was used.

Possessions Inquiry Form, three hundred and fifty-one stayed for the duration of the study and seventy-five defected.

A blanket or quilt was the most frequently listed item being brought into the shelter, with 72.0% of the shelterees bringing this item. Items brought by at least one-third of the occupants included a comb or brush (60.3%), cookies (53.0%), food in cans (50.7%), books (49.8%), flashlight (43.4%), candy (43.4%), gum (43.0%), pillow (33.6%), and watch (32.6%). (See Table 64.)

In terms of the number of shelterees bringing certain items, twice as many shelterees who stayed, in comparison with those who defected, brought the following: air mattress, canned fruit juice, wet and dry towelettes, cheese, water, and drinks in bottles. Conversely, twice as many defecting shelterees, compared with those who stayed, brought games. Defectors also brought more other non-essential items.

Table 64

Shelteree Personal Possessions  
N=426  
(ES A)

Item Brought By At Least 10% of the Shelterees	Total Number of Item Brought	Number of Shelterees Bringing Item	Number of Item Brought By Shelterees Who Stayed	Number of Shelterees Who Stayed Bringing Item (N=351)	Percent of Shelterees Who Stayed Bringing Item	Percent of Item Brought By Shelterees Who Stayed	Number of Item Brought By Defectors	Number of Defectors Bringing Item (N=75)	Percent of Item Brought By Defectors	Percent of Defectors Bringing Item	Percent of Total Population Bringing Item
Blanket or quilt	346	309	390	253	72.0	83.8	56	56	16.2	74.7	72.0
Comb or brush	272	257	224	211	60.1	82.4	48	46	17.6	64.0	60.3
Cookies	326	226	272	186	53.0	83.4	54	40	16.6	72.0	53.0
Food in cans	845	216	743	191	54.4	87.9	102	25	12.1	33.3	50.7
Book	406	212	339	172	49.0	83.5	67	40	16.5	54.3	49.8
Flashlight	191	185	164	159	45.3	85.9	27	26	14.1	34.7	43.1
Pack of gum	481	184	405	156	44.4	84.2	76	28	15.8	37.3	43.1
Candy	272	183	205	153	43.6	75.4	67	30	24.6	40.0	43.0
Pillow	157	143	125	111	31.6	79.6	32	32	20.4	42.7	33.0
Watch	141	139	112	110	31.3	75.4	29	29	20.6	38.7	32.6
Toothbrush	136	131	111	106	30.2	81.6	25	25	18.4	33.3	30.8
Washcloth	148	127	124	104	29.6	83.8	24	23	16.2	30.7	29.8
Deodorant	125	125	99	99	28.2	79.2	26	26	20.8	34.7	29.3
Pen or pencil	136	122	105	96	26.2	77.2	31	30	22.8	40.0	28.6
Cosmetics	194	120	170	101	28.8	87.6	24	19	12.4	25.3	28.2
Women's underwear	170	116	133	93	26.5	78.2	37	23	21.8	30.7	27.2
Drinking cup or glass	481	115	449	99	28.2	93.3	38	16	6.7	21.3	27.0
Deck of cards	137	113	116	96	27.4	84.7	21	17	15.3	22.7	26.5
Pack of cigarettes	302	110	235	90	25.6	77.8	67	20	22.2	26.7	25.8
Fruit	312	107	239	80	24.5	76.6	73	21	23.4	28.0	25.1
Air mattress	107	106	99	98	28.9	92.5	8	8	7.5	10.7	24.9
Canned fruit juice	329	104	308	94	26.8	93.6	21	10	6.4	13.3	24.4
Headache preparation	119	102	101	86	24.5	84.9	18	15	15.1	20.0	23.0
Toothpaste	97	97	80	80	22.7	82.5	17	17	17.5	22.7	22.8
Mirror	96	94	76	76	21.7	79.2	20	18	20.8	24.0	22.1

(Contd.)

Table 64 (Contd.)

Item Brought By At Least 10% of the Shelterees	Total Number of Item Brought	Number of Shelterees Bringing Item	Number of Item Brought By Shelterees Who Stayed	Number of Shelterees Who Stayed Bringing Item (N=311)	Percent of Shelterees Who Stayed Bringing Item	Percent of Item Brought By Shelterees Who Stayed	Number of Item Brought By Defectors	Number of Defectors Bringing Item (N=75)	Percent of Item Brought By Defectors	Percent of Defectors Bringing Item	Percent of Total Population Bringing Item
Sheet or bedspread	103	91	88	76	21.7	85.4	15	15	14.6	20.0	21.4
Matches or lighter	174	90	141	76	21.7	81.0	33	14	19	18.7	21.1
Blouse	100	81	80	65	18.5	80	20	16	20	21.3	19.0
Facial tissue	82	78	67	64	18.2	81.7	15	14	18.3	18.7	18.3
Pants	92	75	73	60	17.1	79.3	19	15	20.7	20.0	17.6
Games	89	74	57	53	15.1	64.5	32	21	36.0	28.0	17.4
Bread	78	69	64	57	16.2	82.1	14	12	17.9	16.0	16.2
Magazine	118	66	96	52	14.8	81.4	22	14	18.6	18.7	15.5
Men's underwear	82	66	65	53	15.1	79.3	17	13	20.7	17.3	15.5
Shirt	77	65	61	52	14.8	79.2	16	13	20.8	17.3	15.2
Paper bag	99	65	77	58	16.5	77.8	22	7	22.2	9.3	15.2
Knife	70	62	57	52	14.8	81.4	13	10	18.6	13.3	14.6
Wet-dry towelettes	298	61	243	55	15.7	81.5	55	6	18.5	8.0	14.3
Radio	61	60	51	50	14.2	83.6	10	10	16.4	13.3	14.1
Cheese	79	60	72	55	15.7	91.1	7	5	8.9	6.7	14.1
Water	82	59	76	53	15.1	92.7	6	6	7.3	8.0	13.8
Children's color book	86	58	73	50	14.2	84.9	13	8	15.1	10.7	13.6
Writing paper	55	54	46	45	12.8	83.6	9	9	16.4	12.0	12.7
Crayons	56	54	46	44	12.5	82.1	10	10	17.2	13.3	12.7
Drinks in bottles	205	53	196	48	13.7	95.6	9	5	4.4	6.7	12.4
Nail clipper or file	53	52	42	41	11.7	79.3	11	11	20.7	14.7	12.2
Plastic bag	100	47	80	37	10.5	80.0	20	10	20.0	13.3	11.0
Shorts	62	47	44	29	8.3	71.0	18	14	29.0	18.7	11.0
Bar of soap	38	38	29	29	8.3	76.3	9	9	23.7	12.0	8.9
Towel	38	37	25	25	7.1	65.8	13	12	34.2	10.0	8.7

## Part Three - Conclusions

### I. Shelteree Characteristics

- A. The age of the five hundred and four persons participating in ES X ranged from nine months through seventy-three years.
- B. The U.S. Census was approximated in population characteristics.

### II. Pre-Shelter Preparedness

#### A. Medical Coverage on Day of Entry

No shelteree was rejected for medical reasons.

#### B. Civil Defense Preparedness

The majority of shelterees did not have a family fallout shelter, but most were familiar with community fallout shelter designations, the civil defense communications system, and civil defense warning devices.

#### C. Leadership Prediction

- 1. The Pre-Shelter Questionnaire item, "Are you a high school graduate?", differentiated the permanent staff from the remaining population. This finding was the result of proper use of Information Cards in staff selection.
- 2. On the MMPI Leadership Sub-Scale the permanent staff scored higher than the remaining population, and the temporary staff scored lower.

### III. Shelter Management Organization

#### A. Chronology of Events

- 1. The temporary phase lasted three hours and twenty minutes.
- 2. Inequitable distribution of shelterees created a space problem in the temporary phase. Furthermore, space utilization plans were not implemented until late in the study, and at that time ineffectively.

#### B. Temporary Shelter Staff Organization

- 1. Contrary to Handbook instructions advising volunteer recruitment of the temporary staff, the Temporary Shelter

Managers randomly appointed staff members. Consequent problems occurring in the temporary shelter organization were attributed largely to this error.

2. The temporary staff ignored many Handbook instructions and incorrectly distributed permanent staff leaflets prior to staff selection, leading to later confusion on task responsibilities.

#### C. Permanent Staff Organization

1. Overcrowding in the large central shelter room impeded permanent shelter organization.
2. Problems in selection of permanent staff members included (a) difficulty of locating selected personnel, and (b) sequential defections of several staff positions.
3. A conclusion on the adequacy of the CDR Handbook for a five hundred person shelter population must await experimental replication on groups of similar or larger size.

### IV. In-Shelter Program

#### A. In-Shelter Activities

1. Responses to information requested on four of eleven EOC messages to the shelter were not received.
2. Handbook instructions on sexually segregated sleeping conditions were not followed.
3. A nursery was organized, but it was not divided into different age groups, as instructions in the Handbook directed.
4. Ad libitum consumption of OCD food stocks was permitted by the shelter staff.
5. Food and water distribution procedures were unsanitary.

#### B. Medical Complaints

1. Headache was the chief medical complaint, followed by cuts, abrasions, insomnia, colds, and nausea.
2. There were more female than male shelterees with medical complaints.



3. One hospitalization occurred, involving stitches for a cut foot. The shelteree returned to the shelter and completed the study.
4. A slight positive relationship between noise level and headache was indicated during the early phase of confinement.

#### C. Post-Shelter Medical Reports

1. Medications stocked in the OCD medical kit and the supplementary CDR medical kit were adequate under the conditions tested.
2. Foot cuts and lacerations occurred largely among children who walked barefoot in the shelter, and were due to open cans and can tops left carelessly on the floor.
3. The majority of defections occurred for non-medical reasons.

#### D. Shelteree Reactions

##### 1. Shelteree Diaries

- a. There were approximately equal numbers of positive and negative scorable comments on shelteree diaries.
- b. The chief negative complaint in the diaries was lack of space.
- c. There was an increase in positive comments and a decrease in negative comments as the study progressed.
- d. There were more negative than positive comments on temporary staff organization of the shelter, and more positive than negative comments on permanent staff organization.

##### 2. Post-Shelter Questionnaire

- a. The overall mean shelteree estimate of endurance of extended shelter confinement was 7.2 days (median 4.6 days). The mean male estimate was 9.3 days (median 5.8 days), and the mean female estimate was 5.7 days (median 4.0 days).
- b. Seventy-six percent of the shelterees expressed willingness to stay another time in the shelter.
- c. When asked to list additional items they felt should be added, shelterees most often mentioned improved

sanitation supplies, storage facilities, more space, bedding, and more varied foods.

- d. Shelterees most often listed bedding and food as items they would bring for another shelter stay.
- e. Six major sources of discomfort were lack of bathing, toilets, sleep conditions, temperature, smells, and space. Almost one-third of the shelterees added boredom, dirt, lack of coffee, and noise.
- f. Negative shelteree opinion on shelter organization efficiency dropped from fifty-eight percent on the temporary phase to twenty-four percent on the permanent phase.

#### E. Defections

1. Eighty-seven shelterees defected prior to study completion. Twenty-eight of this number accompanied those who made a decision to leave. Nine shelterees left for medical reasons.
2. Sixty-eight percent of the defections occurred during the first six hours of shelter confinement.
3. Psychological defections were attributed to extreme overcrowding in the large central room of the shelter during the temporary phase, organizational problems of temporary staff management, length of the pre-processing phase, and inappropriate preparedness and attitude.
4. Forty-five of the early defections occurred in the large central room of the shelter, wherein approximately 6.7 sq. ft./person had resulted from overcrowding.

#### V. Environmental Variables

##### A. Space

Overcrowding in the largest shelter room resulted in 6.7 sq. ft./person in this area instead of the allotted 8.0 sq. ft./person.

##### B. Temperature and Ventilation

Mean shelter THI was 75.4°F (minimum 68.2°F, maximum 81.8°F). Mean outside THI was 71.8°F (minimum 60.3°F, maximum 79.9°F).

##### C. Noise and Lighting

1. Mean daylight noise level in the shelter was 73.2 decibels.
2. Mean daylight illumination level in the shelter was 5.9 foot-lamberts.

#### D. Shelter Supplies

##### 1. Sanitation Kit IV

Items used excessively included toilet tissue (30% of supply), sanitary napkins (25%), and paper cups (794 of 800 OCD stocked cups).

##### 2. Packaged Ventilation Kit

There appears to be a need for a smaller screen mesh on the fan housing to prevent injury to children's fingers, an anti-back-pedaling device to preclude suction of plastic duct-work into the fan, lock-type nuts on all bolts to prevent loosening, and a method for tightening chain slack induced by continual use.

##### 3. Medical Kit C and CDR Supplementary Medical Kit

Based on an extrapolated two-week need, medical supplies consumed excessively included eye and nose drops, antiseptic solution, Band-Aids, and burn medication.

##### 4. Food and Water

Consumption of OCD stocked food and water averaged 414 cal./person/day and 1.4 qt. of water/person/day. However, OCD supplies were supplemented by food adjuncts brought by shelterees, and consequently the total consumption of food and water per person per day cannot be computed.

##### 5. CDR Sanitation Supplies

Additional sanitation supplies, in terms of brooms and mops, would most likely be needed for an extended stay.

##### 6. Shelteree Personal Possessions

- a. The most frequently listed item brought into the shelter was a blanket or quilt. Items brought by at least one-third of the shelterees included, in ranked order, a comb or brush, cookies, food in cans, books, flashlight, candy, gum, pillow, and watch. Items that had been suggested in CDR recruitment letters included food that would not spoil, blanket, and flashlight.
- b. In terms of the number of persons bringing certain items, twice as many shelterees who stayed, in comparison with those who defected, brought an air mattress, canned fruit juice, wet and dry towelettes, cheese, water, and drinks in bottles. Conversely, twice as many defecting shelterees, compared with those who stayed, brought games.

## Chapter 4 - Shelterees Characteristics

### I. Publicity and Recruitment

To implement the recruitment of shelterees for each experimental study, Civil Defense Research prepared and distributed news releases to newspapers, radio and television stations in Athens and surrounding areas. A folder titled "Door to Survival" was used in recruitment for all large experimental studies, stating the need for volunteers and presenting a brief outline of the experiments. At the termination of each large group study, a fact sheet, written originally by the Public Information Office at the Pentagon in July 1964, was given to reporters who had requested information pertaining to the background and purpose of the research, current test conditions and objectives, and health precautions.

Members of the CDR staff addressed numerous groups within a hundred-mile radius of Athens. Letters and postcards were sent to applicants on file to determine their availability for specific studies and to offer the opportunity for additional members of an applicant's family to apply.

Prior to the 30-person, two-week studies, selection of participants took place six weeks before an experiment began. Shelterees for the 160-, 300-, and 500-person studies were selected as much as eight weeks in advance. In all studies an average of fifteen percent more subjects than the number needed were asked to report, to serve as "standbys" or possible replacements for shelterees who did not come, as well as for those who failed to qualify medically. In every study, a majority of the standbys have been used.

The recruitment population from which shelterees were selected for the ten occupancy tests approximated three thousand persons.

In ES X, the 500-person study, a contest was held in which former adult shelterees were to recruit new applicants. The contestant who recruited the greatest number of chosen applicants received a cash award. Two hundred and twenty-two of the five hundred and four shelterees were recruited by this contest.

### II. Selected Groups

In each study an attempt was made to approximate the 1960 U.S. Census with regard to age, sex, education, and race. Race was an added population variable in ES VI, VIII, IX and X. Comparisons among experimental groups on the variables of age, sex, occupation, and education are presented in Table 65. A comparison of the ten studies with the 1960 census can be found in Table 66.

Table 65

Comparisons of Selected Shelterees on Age,  
Sex, Occupation, and Education  
(ES I-X)

Comparison	ES I	ES II	ES III	ES IV	ES V	ES VI	ES VII	ES VIII	ES IX	ES X	Total
Age											
0-6	0	0	0	0	0	34	33	36	22	73	198
7-15	1	8	10	28	9	91	132	108	32	152	571
16-25	11	4	2	0	4	49	54	56	35	79	294
26-35	8	2	6	2	3	56	33	54	24	79	267
36-45	5	8	5	0	4	41	35	36	15	76	225
46-55	5	3	3	0	5	19	12	22	11	30	110
56-75	0	5	4	0	5	10	8	9	8	15	64
	30	30	30	30	30	300	307	321	147	504	1729
Sex											
Male	15	15	15	15	15	152	139	148	73	208	795
Female	15	15	15	15	15	148	168	173	74	226	934
	30	30	30	30	30	300	307	321	147	504	1729
Occupation											
Professional	4	3	2	2	6	35	17	32	12	37	150
White collar	5	1	2	0	2	30	10	16	5	27	98
Skilled labor	2	5	5	0	4	15	14	22	19	31	117
Unskilled or semi-skilled	2	1	2	0	4	13	9	17	8	44	100
Unemployed	3	5	1	0	0	1	9	4	7	9	39
Housewife	5	5	7	0	4	38	39	45	19	78	240
Student	9	10	11	28	10	136	175	149	57	216	801
Pre-school children	0	0	0	0	0	32	34	36	20	62	184
	30	30	30	30	30	300	307	321	147	504	1729
Education											
8 years or less	4	14	15	28	16	128	166	158	66	266	861
9-12	14	11	8	0	8	93	100	101	52	142	529
13-16	10	3	6	1	5	64	32	45	23	82	271
17+	2	2	1	1	1	15	9	17	6	14	68
	30	30	30	30	30	300	307	321	147	504	1729

Table 66

Comparison of Shelterees with 1960 U.S. Census on  
Variables of Age, Education, Sex, and Race  
(ES I-X)

Item	U.S. Census (1960)	ES I	ES II	ES III	ES IV	ES V	ES VI	ES VII	ES VIII	ES IX	ES X
Number of Shelterees		30	30	30	30	30	300	307	321	147	504
Age Range (years)		15-50	9-67	7-66	7-35	7-70	3-66	2-67	1-67	1-65	9 (mos.)-73
Average Age (years)											
Mean		31.0	33.4	31.4	11.2	33.1	23.0	20.3	22.4	23.9	23.0
Median	29.5	29.0	35.5	27.0	9.0	31.0	17.0	15.0	17.0	22.0	20.0
Average Education <sup>a</sup> (years)											
Mean		11.7	10.6	11.3		10.3	12.8	11.7	11.5	11.6	11.6
Median	10.6	12.0	12.0	11.0		10.0	12.0	12.0	12.0	12.0	12.0
Sex											
Male	49.3%	50.0%	50.0%	50.0%	50.0%	50.0%	50.7%	45.3%	46.2%	49.7%	41.3%
Female	50.7%	50.0%	50.0%	50.0%	50.0%	50.0%	49.3%	54.7%	53.8%	50.3%	58.7%
Race											
White	88.57%	100.0%	100.0%	100.0%	100.0%	100.0%	88.7%	100.0%	86.3%	81.0%	87.1%
Negro	10.53%	0.0%	0.0%	0.0%	0.0%	0.0%	11.3%	0.0%	12.1%	19.0%	12.9%
Other	.90%								1.6%		

<sup>a</sup>Shadow Staff not included.

<sup>b</sup>Computed for shelterees 25 years of age and older.

Shelterees have ranged in age from 9 months-73 years. Before final selection, all prospective shelterees were medically screened. Volunteers were required to have physical examinations prior to participation in ES I-V. The large number of shelterees in ES VI-X prohibited pre-entry physical examinations, but each shelteree was required to submit a self-report of his medical history and a completed medical inquiry form indicating his current state of health. Medical examinations were then given to those who listed a current ailment which might adversely affect them or others as a consequence of confinement, along with all shelterees fifty years of age and older, and in ES VI and VII, shelterees under ten years of age.

#### Experimental Study I

Experimental Study I was a four-day study (14-18 December, 1962) designed to test conditions of austerity. These conditions involved thirty men, women, and children living in close confinement, sleeping on the floor, and subsisting on severe rations of food and water.

The thirty shelterees were drawn at random from one hundred and sixty-five applications which had been stratified by age and sex. Fifteen males and fifteen females were selected. The age range of the fifteen women was from 15-47 years, and for the men 16-50 years. The shelter medic was a medical student from the Medical College of Georgia and the Shelter Manager was a student from the University of Georgia, School of Veterinary Medicine.

The mean educational level of the adults was 12.2 years. There were, however, two men of borderline literacy and four college graduates, including the shelter medic and the Shelter Manager. In terms of occupation, the range among the shelterees was wide--a truck driver, prison guard, two salesmen, an electrician's helper, and two unemployed male adults. Several women had regular jobs; most were either students or housewives.

#### Experimental Study II

Experimental Study II was a two-week study held 16 February-March 1, 1963. The thirty shelterees were drawn at random from a pool of eight hundred and sixty-seven applications which had been stratified by age and sex. There were fifteen males and fifteen females. The youngest boy was 9, the youngest girl was 10; the oldest man was 61 and the oldest woman 67. There were seven children between the ages of 9-13, sixteen adults in the range of 16-46 years, and seven older adults between 50-67 years of age. The mean educational level for the adults was 10.5 years.

Most of the adult females were housewives. Of those who were gainfully employed, one was a cook, one a textile weaver, and the other a welfare worker. For the men the range of occupations covered

such work as farming, construction, sales, and law. The Shelter Manager, a law student 23 years of age, was specifically selected and trained for this assignment. The shelter medic, 28 years of age, was a volunteer from the Medical College of Georgia.

#### Experimental Study III

Experimental Study III, implemented 27 April-10 May, 1963, was the second two-week study to be completed. The thirty shelterees who participated were selected by random assignment from a pool of 1,153 applications which had been stratified by age and sex. The fifteen males and fifteen females in the experiment ranged in age from 7-66. The mean educational level for the twenty adults was 11.5 years.

Four of the shelterees were chosen for particular duties. The Shelter Manager was 27 years old, a Lieutenant in the Navy Supply Corps School (Athens, Georgia). One shelteree selected for the study was a 24-year-old public health nurse. Another shelteree who had training and experience as a civil defense nursing assistant was appointed as the secondary nurse. Finally, an advanced doctoral candidate in clinical psychology acted as a psychological observer.

The adult males included two farmers, a poultry plant worker, a shoe-cutter, a radio instructor, and an office manager. Most of the women were housewives, although three were regularly employed--a textile worker and a library clerk in addition to the registered nurse. There were ten children, five boys and five girls between the ages of 7-15. All of the children were enrolled in school at the time of the study.



#### Experimental Study IV

Experimental Study IV was a one-week occupancy (July 20-27, 1963) test involving a group of twenty-eight elementary school children and two adults.



The children were randomly selected from a pool of ninety-five elementary school age applicants. There were fourteen boys and fourteen girls ranging in age from 7-12.

The two adult shelterees, the Shelter Manager and the nurse, were specifically selected and trained for their assignments. Both the first and alternate Shelter Managers were elementary school principals in their mid-thirties. The nurse was a 29-year-old public health nurse.

#### Experimental Study V

Experimental Study V was a two-week study conducted 8-21 February, 1964. The thirty shelterees who participated in ES V were selected randomly from a pool of 1,321 applicants. The fifteen males and fifteen females in the experiment ranged in age from 7-70. The mean educational level of the twenty adults was 10.4 years.

Three shelterees were chosen for particular duties. The Shelter Manager was a 31-year old Navy Lieutenant, stationed at the U.S. Navy Supply Corps School. Although designated as manager, he received no specific management training. Another shelteree, also a Naval Officer, kept experimental records (food and water consumption records, vigilance task, etc.). The shelter nurse was a 51-year-old public health nurse.

#### Experimental Study VI

Experimental Study VI was a weekend test, conducted 31 July-2 August, 1964. The 300-person shelter group consisted of men, women, and children, aged 3-66 years. Seventy-five percent of the group was composed of family units and twenty-five percent individuals.



The total group of 300 persons included the shelter management staff, four medics, seven Civil Defense Research observers, five Office of Civil Defense observers, one observer from the U.S. Army Military Police School at Ft. Gordon, Georgia, and three engineers from the General American Transportation Corporation, MRD Division, Niles, Illinois. The Office of Civil Defense observers represented the Washington office and the three training centers located at Battle Creek, Michigan, Brooklyn, New York, and Alameda, California.

#### Experimental Study VII

Experimental Study VII was a one-week test held during the week of 19-26 June, 1965. The 307-person group consisted of men, women, and children in the age range of 2-67 years. The group included a doctor and a nurse (two-person teams, each composed of one doctor and one nurse, worked eight-hour shifts).

Eighty percent of the shelteree group was composed of family units and twenty percent were individuals without family members present.

#### Experimental Study VIII

Experimental Study VIII was conducted the weekend of 10-12 September, 1965. The 321-person shelter group consisted of men, women, and children in an age range of 1-67 years.

Seventy-nine percent of the shelteree group was composed of family units and twenty-one percent were individuals without family members present.

#### Experimental Study IX

Experimental Study IX was a weekend study held 29 April-1 May, 1966. The study was primarily a reduced space allotment test, with space of six to seven square feet per person provided, including storage. One hundred and sixty persons (147 shelterees, 13 CDR staff) participated in the experiment.

The age range was 1-65 years, and the median age of 22 years is the highest for large group CDR occupancy tests.

#### Experimental Study X

Experimental Study X was conducted on the weekend of 22-24 July, 1966. The 504-person study is the largest study conducted to date and it is also the study with the greatest age range--9 months-73 years.

### III. Civil Defense Preparedness

As part of the Pre-Shelter Questionnaire, the shelterees were given various questions to determine their preparedness for a national emergency. With little exception, the Pre-Shelter Questionnaire for the entire ten experimental studies showed that the shelter populations were not well prepared for the eventuality of nuclear attack. Generally, shelterees had neither the knowledge nor material necessary to protect themselves and their families from radioactive fallout, although in six of the ten studies fifty percent or more of the shelterees knew the location of a community shelter where they could take cover (see Table 67).

### IV. Study Participation

An analysis of the Pre-Shelter Questionnaire for ES I-IV revealed that shelterees became acquainted with the research projects through diverse channels. Direct contact of research recruitment personnel with interested groups was the major source of introduction to the research program. Motivation to participate was most often found in a desire to be better educated for survival followed by the desire to help the national defense effort. Monetary reward and curiosity also served as motivating forces.

### V. Conclusions

#### A. Publicity and Recruitment

1. Successful methods of publicity and recruitment included news releases, talks to civic and school groups, help from previous shelterees, the use of newspaper advertisements, and a recruitment contest.
2. As studies successively draw from the available population, recruitment becomes increasingly difficult.

#### B. Selected Groups

A total of 1,729 persons, aged 9 months-73 years, have participated in the experimental studies to date, approximating the 1960 U.S. Census on variables of age, education, and socio-economic status.

#### C. Civil Defense Preparedness

Approximately half of the total shelteree population professed knowledge of the location of a community fallout shelter.

Table 67

Sheltering Indication of Civil Defense Preparedness  
(ES I-X)

Question	Affirmative Sheltering Response in Percentage of Shelter Population									
	ES I	ES II	ES III	ES IV	ES V	ES VI	ES VII	ES VIII	ES IX	ES X
Do you have a family fallout shelter?	0	0	3	11	7	2	2	3	1	1
Have you participated in civil defense classes?	10	12	23	54	30	12	7	6	10	13
Do you know of a community shelter where you could take cover?	47	40	30	61	57	58	45	50	53	65
Do you have emergency supplies of food and water in your home?	20	20	40	39	47	17	17	25	10	18
Do you have emergency medical and first aid supplies in your home?	30	24	50	46	47	37	56	41	39	40

## Chapter 5 - Shelter Facilities

### I. The Experimental Fallout Shelter Used in ES I-V

A simulated fallout shelter was constructed within the Psychological Laboratories building on the campus of the University of Georgia. The shelter was of plywood and plaster board construction on 2' x 4' framing with fiberglass insulation. The floor was of concrete.

The interior dimensions were 25' x 14.5' x 6.5'. The inside walls were painted white, and the floor and exterior painted grey. Within the walls were constructed six observation ports having one-way glass mirrors, and so placed as to give complete viewing of the shelter interior. Small doors at each observation port could be closed when the port was not in use. Two clear glass ports were provided for motion picture cameras.



In one shelter corner a latrine area (4.4' x 4.25') was located as part of permanent construction. This area was equipped for the installation of a flush toilet. A small wash basin, adjacent to but outside of the latrine area, was installed. Water to the toilet and wash basins was controlled and metered from outside the shelter. Such facilities, however, were used only in pilot studies and not in the main experimental studies.

Within the shelter, a movable wall was constructed and suspended on tracks to accommodate the shelter space to any number of shelterees. A door in this wall permitted entrance to the occupied section of the shelter, and a large air-tight door provided entrance to the overall shelter area.

One 6.5' x 3' section of the shelter wall was constructed as a knock-out safety door on which a means of passing materials into or out of the shelter was also provided.

The main observation and recording room was located at one outside end of the shelter. From this room the interior of the shelter could be viewed through a large one-way vision mirror. This room housed all recording, control, and communications equipment.

#### A. Instrumentation Specifications

The following specifications were constant throughout ES I-V.

Air Conditioning--The basic air conditioning unit, a Chrysler AT-500 series with associated components, cooled the shelter space. The blower unit and coils were suspended from the second floor above the main observation room, with the condensing unit located outside of the building. This air handling system provided 0-1800 cubic feet per minute of fresh air and recirculated air in combinations varying to approximately 75% fresh air.

Heating--The air was heated by thermostatically controlled electric resistance heaters located in the air supply duct following the cooling unit.

Filtering--The air supply was filtered through both electrostatic and charcoal filters located in the supply duct.

Air Control System--A system of ducts with both manual and motorized dampers, and with thermostats provided control of air flow and air temperatures.

Humidifier--A humidifier unit was located in the air supply duct to maintain the relative humidity lower level. Lower level ranges were 20%-80% relative humidity.

#### B. Basic Recording System

Six Rustak recorders (w/thermistors) of varying specifications served for permanent recording of environmental and behavioral variables. Figure 5 presents a picture of the shelter area and observation area. Figure 6 presents the air conditioning system and Figure 7, the location of observer posts and thermistors.

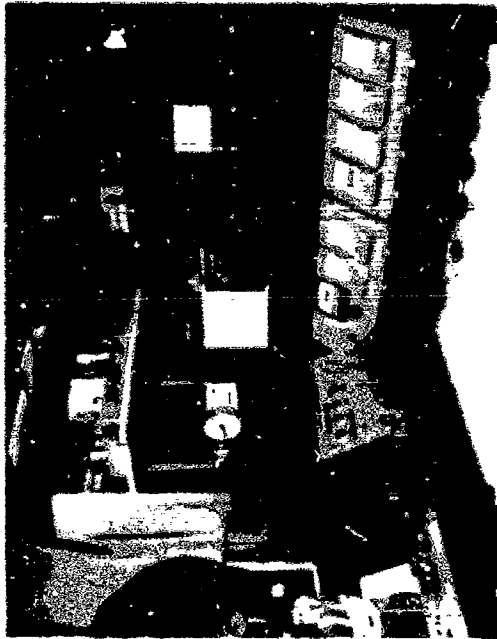
For further details concerning instrumentation and recording specifications, see Final Report, Shelter Occupancy Studies at the University of Georgia, 1962-1963.

## II. The Experimental Shelter Used in ES VI

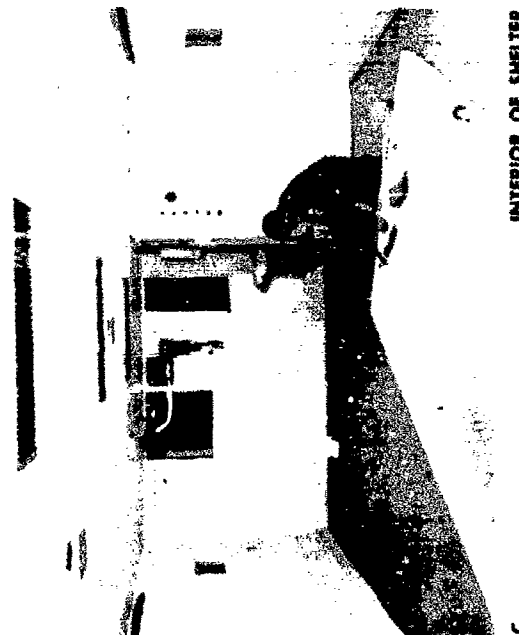
The experimental shelter used in ES VI was located in the basement of the Georgia Center for Continuing Education on the University campus, and was marked and stocked in accordance with procedures established by



A LEFT INTERIOR CORNER OF MAIN OBSERVATION ROOM



B RIGHT INTERIOR CORNER OF MAIN OBSERVATION ROOM



C INTERIOR OF SHELTER



D EXTERIOR OBSERVATION PORTS

Figure 5. Shelter area and observation area.

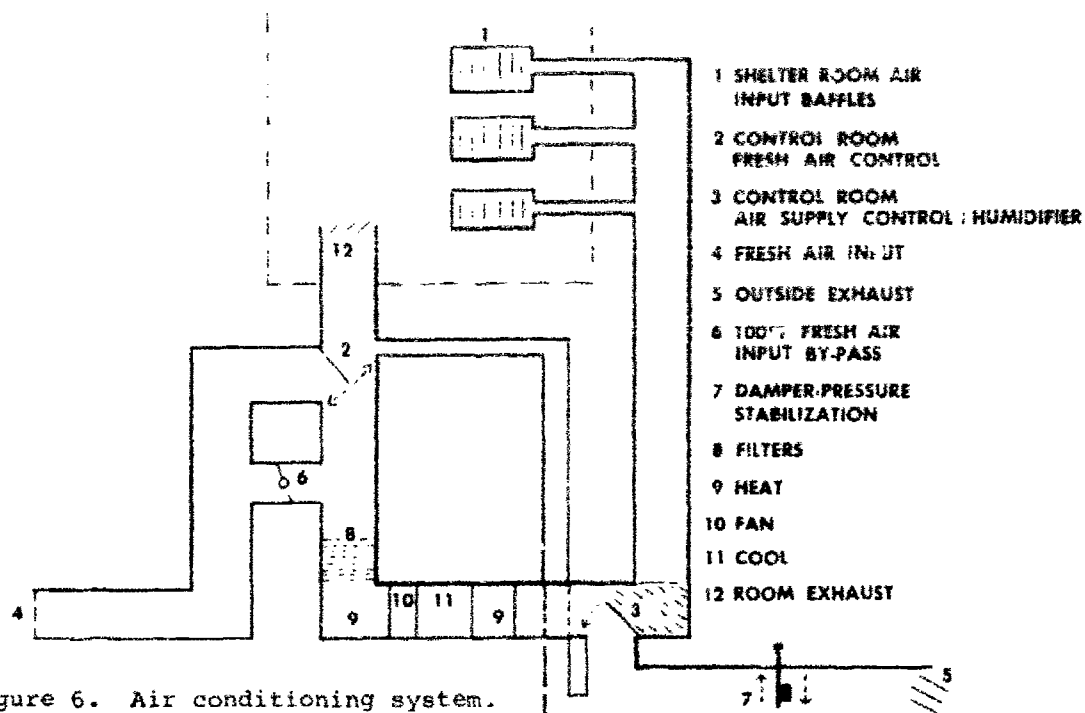


Figure 6. Air conditioning system.

- M: MAIN OBSERVATION ROOM  
 A, B, C, D, E: OBSERVER STATIONS  
 1-8: THERMISTOR LOCATIONS

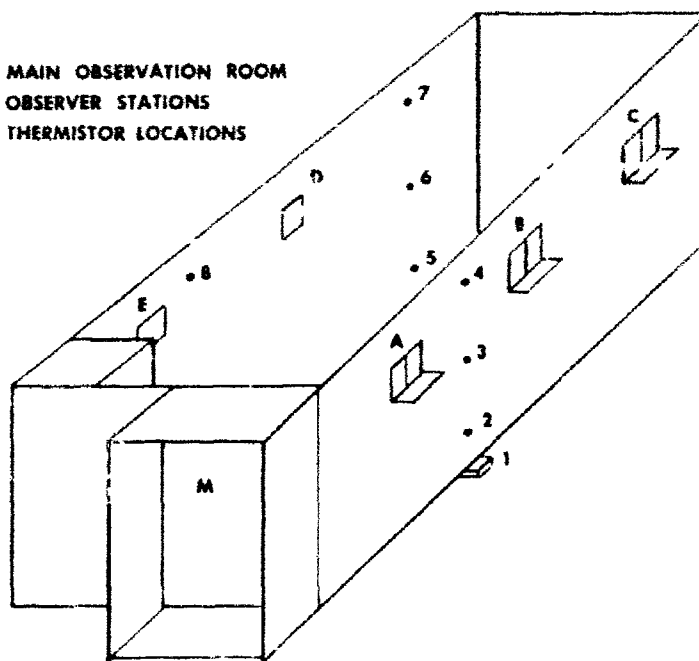


Figure 7. Location of observer ports and thermistors.



the National Shelter Program. The 300-person facility consisted of two rooms, the larger room being approximately 2500 square feet in area and the smaller room approximately 500 square feet. There was 10 square feet of floor space per shelteree, including storage. The ceiling was 12.5 feet high.

Temporary plywood walls, behind which were observation areas, are noted in Figure 8. Floors were concrete but covered with 3/16" corrugated fiberboard during sleeping periods. Six 36" x 24" x 6' cubicles were constructed as commode areas.

Main lighting was provided by 40-watt fluorescent ceiling lights, supplemented by 200-watt incandescent lamps for filming. Three 15-watt lamps, which could not be extinguished by the shelterees, provided nighttime lighting. Fifteen-watt lamps were also used to illuminate the commode areas. General American Transportation Corporation, MRD Division, coordinated the testing of certain ventilation conditions through the use of their OCD Test Vehicle No. 1. Also indicated in Figure 8 are locations of the five one-way observer ports, the five camera ports, the shelter supplies, and the toilets (Sanitation Kits).

The main observation room, observation port number one at one end of the larger room, contained all recording and communications systems (temperature, effective temperature, noise level, waking-hour audio recording, and EE 8 field telephone to the shelter and to the OCD test vehicle). From this port the larger room and a portion of the smaller room could be viewed through a large one-way vision mirror.

### III. Shelter Facility Used in ES VII, VIII, and IX

The experimental shelter facilities used in ES VII, ES VIII and ES IX were all located above ground level in a building in the downtown area of Athens, Georgia. The ES VII and ES VIII shelters were multi-chambered facilities on the first and second floors, whereas the ES IX shelter consisted of a single chamber on the second floor. In all three studies, the shelters were marked and stocked in accordance with procedures established by the National Shelter Program.

The ES VII and ES VIII shelters contained an area of approximately 3000 square feet (see Figure 9). The first floor consisted of approximately 2000 square feet, and the second floor of approximately 1000 square feet. Each shelteree had 10 square feet of floor space, including storage. The single chamber in ES IX contained 962 square feet, giving each shelteree 6 square feet of floor space including supply storage. Walls in all three studies were concrete (existing building walls) and plywood. All floors were concrete with the exception of Room A, constructed of wood flooring. The ceiling on the first floor of the building was 12.5 feet high, and the ceiling on the second floor was 10 feet high.

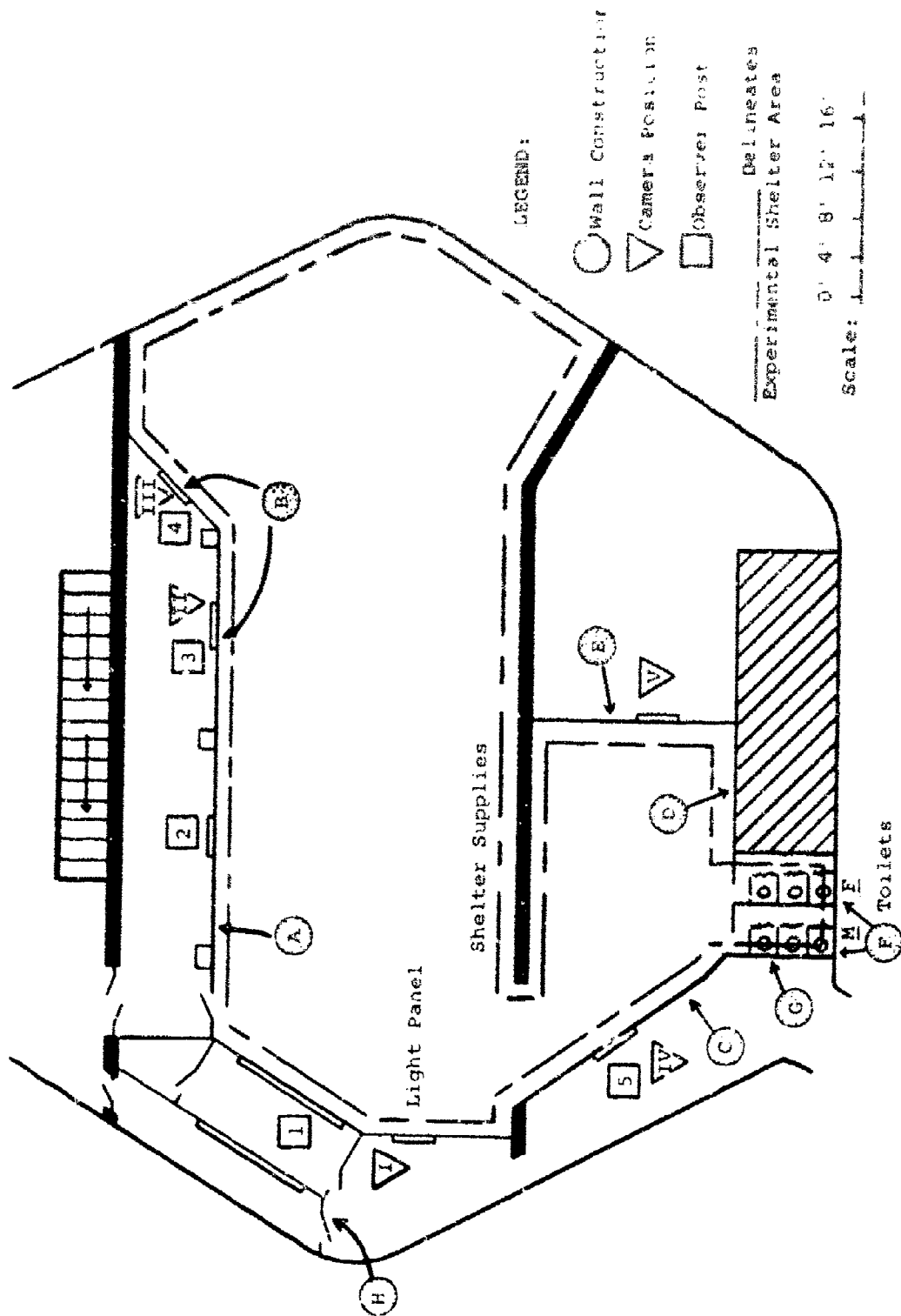


Figure 8. The 300-person shelter (ES VI).

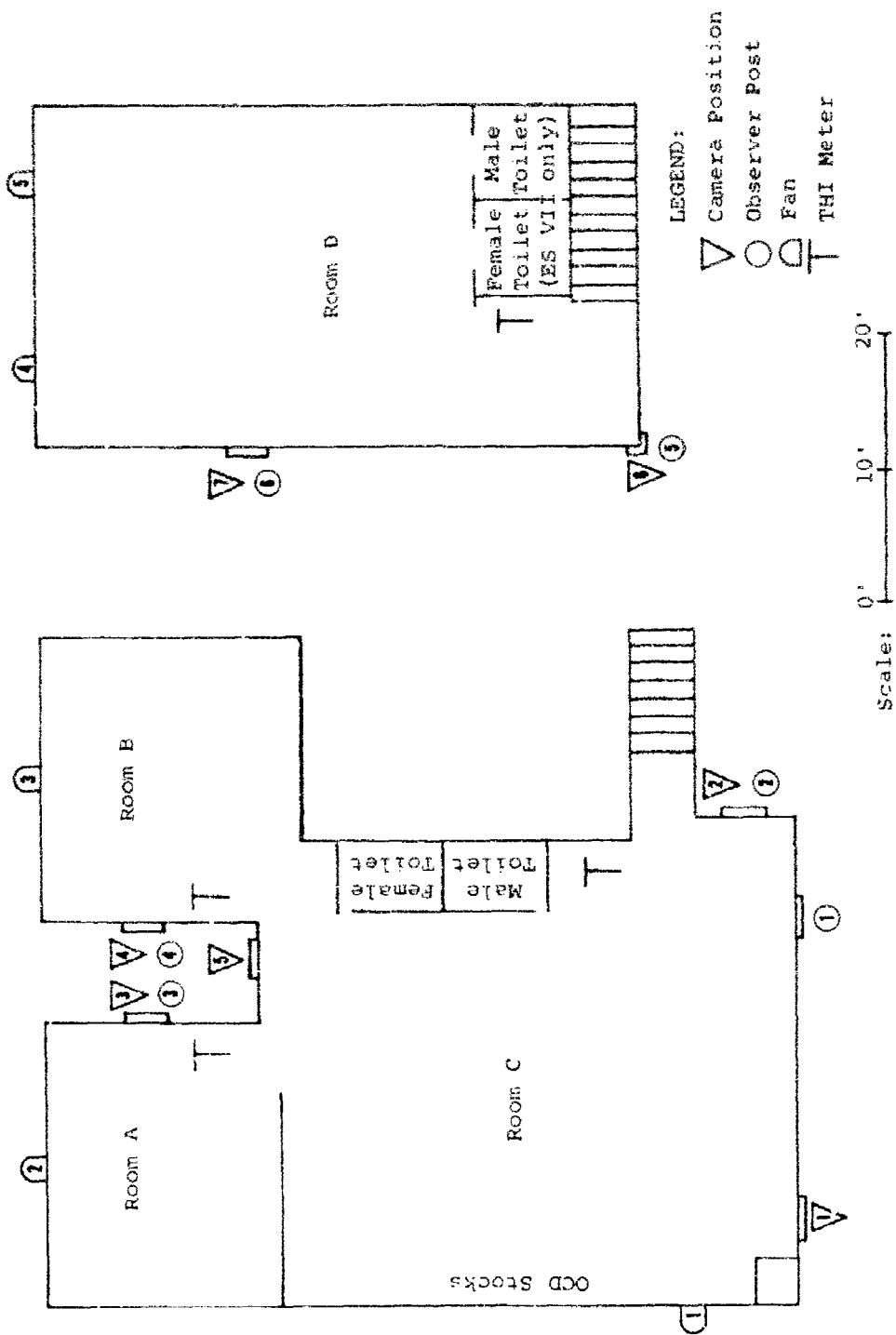


Figure 9. The 300-person shelter (ES VII and VIII) and the 160-person shelter (ES IX).

In ES VII and ES VIII nine fans were used for ventilation. Three fans were exhaust fans located in the observation areas outside the shelter. Five fans were located at various points within the shelter area and were reversible, with three intake and three exhaust speeds. One of the fans inside the shelter was a small floor fan. (Fan capacities were presented in the section on ES X.) ES IX used the same extra-shelter exhaust fans and two intake-only fans in one end wall of the room operated from the control room. Thermistors were used in all three studies. In addition, Temperature-Humidity Index (THI) meters were used in ES VII inside the shelter and in ES IX outside the shelter, a sling psychrometer was utilized in ES VII, and a power psychrometer was used inside and outside the shelter in ES VII and ES VIII.

Shelter lighting in ES VII and ES VIII was provided by sixteen 170-watt fluorescent ceiling lights. In ES VII additional camera lighting was provided by thirty-four 200-watt incandescent bulbs used only during filming. Daytime lighting in ES IX consisted of four 170-watt fluorescent ceiling lamps, and whatever daylight filtered through the two fans. Cardboard covered the outside of the windows in ES VII to restrict illumination to available lighting within the shelter, but was removed in ES VIII to permit natural lighting. Fifteen-watt frosted night lights were used in ES VII, but were changed in ES VIII and ES IX to 15-watt, red lamps in order to reduce illumination.

The locations of one-way observation ports, camera positions, fans, and temperature recording devices (THI meters or thermistors) in ES VII-IX are indicated in Figure 9. Locations of shelter supplies in ES VII, ES VIII, and ES IX are also indicated in Figure 9. For drawing of ES X shelter, see ES X write-up elsewhere in this report. OCD supplies included medical, sanitation, and radiological kits, and food and water. In addition, four mops, four brooms and four pounds of rags were included in ES VIII but these items were reduced in ES IX to one broom and one mop. In ES VII, U. S. Army Engineer Research and Development Laboratories (USAERDL) sanitary vaults were used in three of the four commode areas, the SK IV chemical commodes being used in the fourth commode area. The USAERDL units were installed prior to the study, leaving only the SK IV Kit to be set up by shelter management. In ES VIII and ES IX, SK IV chemical commodes only were used.

The control room for ES VII-X was located on the first floor at the rear of the building and was approximately 14' x 20' in dimension. This room contained the measuring, recording and communications equipment for the three studies. Thermistors were monitored in the control room, as well as a combination public address-intercom system for communication with the shelter. A wireless intercom was used in ES IX for communication between the control room and the second floor observation area. In ES VII an additional wireless microphone receiver and tape recording equipment for use by the filming personnel was used.

Noise and illumination levels were periodically measured by portable models of a General Radio Company Type 1565-A sound level meter and a Weston Model 759 meter, respectively.

In ES VIII a simulated Emergency Operating Center (EOC) program was initiated to be used in this and subsequent experimental studies. The EOC program consisted of pre-planned scheduled announcements to, and information requests from the shelter. In ES VIII and ES IX, EOC communications were established through the same combination public address-intercom system mentioned previously as used for shelter communication. In addition, a CDV-715 meter in the shelter was wired to an identical unit in the control room to provide programmed radiological inputs for the shelter meter.

## Chapter 6 - Pre- and Post-Shelter Processing

### I. Pre-Shelter Processing

Prior to the actual period of confinement, each shelteree underwent several evaluative procedures which constituted pre-shelter processing. Processing procedures were essentially the same for Experimental Studies I-X. The following phases were involved.

#### A. Roster Check and Identification Procedures

Shelterees were received and oriented in the pre-processing area several hours before study confinement. Each person's name was checked against a previously prepared list.

Shelterees in ES I were assigned a number which appeared on a band worn on the upper part of the arm. Photographs were made of subjects in groups of threes.



Numbered vests were issued to shelterees in ES II, III, IV, and V. Numbers were assigned according to age and sex; the youngest received the lowest number, and females received odd numbers. Shelterees were photographed in their vests in groups of threes.

In ES VI each shelteree was issued a number on a card and photographed in groups of threes. Each shelteree was assigned to one of six sections and received a ticket to designate the shelter section. The shelter staff members wore vests, with initials of their staff title or section letter on the front and back of the vests, e.g., D.T., Director of Training.

In ES VII shelterees were photographed in groups of threes with an identification number. Each picture, name, and number was recorded. No photographs were made of shelterees in ES VIII-X.

## B. Possessions Check Inquiry

In ES I-VI shelterees were notified by mail that only certain items would be allowed in the shelter. Possessions were checked, and such items as small toilet articles were carried into the shelter in a small shelter bag.

The first one hundred and fifty adults arriving were each given a Possession Inquiry Form in ES VII. In a few instances, the head of the family completed the form for all family members, so that the sample consisted of a total of one hundred and seventy-six persons. All shelterees in ES VIII completed the form, but in ES IX it was given only to persons fourteen years of age and older. In ES X the form was given to a sample of four hundred and twenty-eight shelterees fourteen years of age and older. The inquiry form included a complete listing of all items the shelterees brought to the shelter.



## C. Medical Inquiry and Examinations

In addition to a detailed Medical History Questionnaire included in the shelteree application form and a medical examination by the family physician prior to selection, shelterees in ES I-V were examined again by consulting physicians before entering the shelter. This involved a check of heart rate, pulse, blood pressure, temperature, lungs, and respiratory tract. A blood count and urine analysis were made on each subject.

In the later studies, ES VI-X, prospective shelterees submitted a medical history statement prior to selection. On the day of entry subjects were required to complete a Medical Inquiry Form to detect any current physical ailment which might adversely affect the subject or others as a result of confinement, e.g., a cold, sore throat, earache, asthma, or toothache. Anyone reporting such a condition was referred to a consulting physician for further evaluation and designated a non-routine referral. Routine examinations were required in ES VI and VII of persons fifty years of age

and older and of children ten years of age and younger. Routine examinations were required only of shelterees fifty years of age and older in ES VIII-X.

#### D. Shelteree Testing

In all studies shelterees were tested using one or a combination of various personality, intellectual, physical fitness, and psychomotor measures.

#### E. Project Director's Address

Prior to shelter entry, shelterees in each experimental study were addressed by the Project Director who pointed out the national significance of the study, suggested the need for maximal cooperation, and congratulated the shelterees on their participation.



One of the purposes of ES VIII was to evaluate the effects of a ten-minute orientation address. The Project Director attempted to motivate shelteree assumption of the responsibility of self-government by mentioning the following points:

1. Emergency self-management by the shelterees with untrained staff leadership.
2. The presence of a handbook with other shelter supplies to describe shelter operation.
3. Jobs for almost all adults.
4. A need to follow instructions to the letter with no omission or unnecessary deviation.

Shelterees in ES IX and X were told similarly that they would manage the shelter with the aid of the Handbook.



In summary, pre-shelter processing procedures required time periods varying from two to ten hours. (See Table 68.) The length of this phase appeared to be an irritating factor with the larger occupancy groups.

## II. Post-Shelter Processing

Although pre-shelter processing was basically the same for all ten experimental studies, post-shelter processing techniques and procedures varied as a function of the number of shelterees and the objectives of the study. In all studies, however, a Post-Shelter Questionnaire was administered which, though differing somewhat from study to study, allowed the shelterees to evaluate certain aspects of shelter life.

Since ES I-V were concerned with the physical and psychological effects of confinement, the Post-Shelter Questionnaire reflected this concern. It included a series of items, believed to be potential discomfort factors. The shelterees ranked these items on a comparative basis and on a rating scale designed to get shelteree evaluation of specific variables relating to training and procedures, environmental conditions, food and equipment, and social and psychological factors.

With ES VI the emphasis of the studies changed and the Post-Shelter Questionnaire was modified accordingly. Shelter management became a primary concern; thus, questions were added to the basic form relating to shelteree interaction with, and involvement in, management. The Post-Shelter Questionnaire was administered in the shelter on the day prior to exit in the one- and two-week studies, and approximately an hour before exit in the weekend studies.

For post-shelter processing, shelterees went through the same battery of tests as they had during pre-shelter processing in Studies I-V. The actual post-shelter processing procedure for ES I-V was basically the same. Since the number of shelterees was small, they were released three at a time, the order determined numerically or alphabetically. As a rule, each shelteree received a medical examination first, followed by a physical fitness battery. The shelterees were then given a lunch break. Following this, whenever possible, alternate forms of the pre-shelter processing psychological tests were given. In the earlier studies, in which a longer series of tests was used, the shelterees were given two food breaks instead of one. In ES V, although the shelterees followed the same basic procedure, they were divided into three groups and followed the sequence in different order. After the tests the shelterees heard a final address by the Project Director and were then dismissed.

The large number of shelterees used in ES VI-X necessitated changes in post-shelter processing procedures. The Project Director's

Table 68  
Duration of Pre-Processing  
(ES I-X)

Experimental Study	Specified Arrival Time	Shelter Entry Time	Hours Spent in Pre-Processing
ES I	8:30 A.M.	5:35 P.M.	9h 05m
ES II	8:30 A.M.	6:40 P.M.	10h 10m
ES III	8:30 A.M.	4:30 P.M.	8h 00m
ES IV	8:30 A.M.	5:00 P.M.	8h 30m
ES V	8:30 A.M.	1:30 P.M.	5h 00m
ES VI	2:00 P.M.	4:00 P.M.	2h 00m
ES VII	9:00 A.M.	11:55 A.M.	2h 55m
ES VIII	1:30 P.M.	4:22 P.M.	2h 52m
ES IX	4:00 P.M.	6:18 P.M.	2h 18m
ES X	2:00 P.M.	5:40 P.M.	3h 40m

address was delivered just prior to exit, and a count was made of shelterees as they left the shelter. Thus, post-shelter processing for these large group studies consisted only of the completion of the Post-Shelter Questionnaire, the Project Director's address before exit, and a count of the shelterees as they left the shelter. ES VII took place in a building in close proximity to the parking area that the shelterees were instructed to utilize for study duration; thus, they were dismissed as they left the shelter. Experimental Studies VII-X, however, were conducted in a University building in the downtown Athens area some distance from the shelteree parking area. This arrangement necessitated providing bus transportation for the shelterees from the shelter to their cars.

### III. Conclusions

- A. The extent of pre-shelter testing, particularly with regard to individual testing, became less as occupancy groups became larger. With larger groups an interest in leadership prediction developed.
- B. The lengthy pre-processing phase had an adverse morale effect in the larger shelteree tests.

## Chapter 7 - Trained Shelter Management

### I. Experimental Studies I-IV

In ES I-IV a Shelter Manager trained by CDR was in command of the shelterees. Management leadership potential for these 30-person groups was initially acquired from general applicants of those interested in participation in CDR studies. Criteria for selection included age, sex, intelligence, vocational experience, previous participation in civil defense activities, and leadership. Prospective candidates attended an orientation session at CDR. Table 69 presents the characteristics of the resultant shelter leaders utilized.

Shelter Manager training for ES I-IV included such topics as general civil defense information, previous research, experimental design and procedures, shelter supplies and equipment, and shelter command responsibilities. Each Shelter Manager subsequent to the first was able to benefit from what had been learned in the previous studies. In the overall management program the emphasis was on keeping the shelterees occupied. Since in ES IV the Shelter Manager was dealing only with children, the necessity of having an inside assortment of recreational activities readily available to occupy them was stressed. The two Shelter Managers trained for ES IV were given song and game books for study as well as a child's textbook on radiation and atomic energy.



There was no detailed time schedule for in-shelter activities for ES I-IV. Consequently, Shelter Manager training included the specification of immediate requirements such as the preparation of the chemical commode and the establishment of an organizational structure of responsible persons to handle detailed routines such as food and water distribution. In-shelter training periods were to occur at appropriate times when the greatest number might benefit from them and when the need for an organized activity such as training became apparent. Scheduling was left to the Shelter Manager. Since the Shelter Manager for ES III was more authoritative than the other Shelter Managers, the shelter program of ES III was more structured than the other studies.

Table 69

Characteristics of Trained Shelter Leaders  
(ES I, II, III, IV, and VI)

Experimental Study	Position	Age	Occupation	CD and Related Experience	Training in Contact Hours
ES I	Shelter Manager	27	Veterinary student	Teaching, Highway Patrol Officer	10 plus reading
ES II	Shelter Manager	23	Law student	None	23
ES III	Shelter Manager	27	U.S. Navy instructor	U.S. Navy Antarctic Research	10 plus reading
ES IV	Shelter Manager	33	Elementary school principal	Teaching, education administrator	9 plus reading
	Shelter Manager (Alternate)	35	Elementary school principal	Teaching, education administrator	9 plus reading
ES V*	--	--	--	--	--
ES VI	Shelter Manager	37	Publishing company agent	Teaching, education administrator	12
	Assistant Shelter Manager	28	U.S. Navy instructor	Manager, ES III	12
	Director of Operations	41	County Civil Defense Director	Five OCD courses	12
	Director of Information and Training	34	Counselor, teacher	Teaching	12
	Director of Supply and Maintenance	29	U.S. Navy instructor	U.S. Navy	12
	Section Leader	31	U.S. Civil Service Management Analyst	SMI course	12
	Section Leader	29	Graduate Student, Zoology	SMI course	12
	Section Leader	36	Veterinary student	None	12
	Section Leader	39	Deputy, Security and Law Enforcement	CD planning and testing	12
	Section Leader	48	U.S. Civil Service Operational Planner	Disaster control	12
	Section Leader	33	Manager, County ASCS Office	Survival course	12

\*Shelter Manager was untrained, and is discussed in another chapter.

After each study, the Shelter Manager submitted a written report evaluating various aspects of the study as related to management. Sometimes the observations were made in such broad terms as to be of limited value. The reports were helpful when they were specific and clearly explained how the problems were met. For example, when shelterees complained about the taste of the water, the Shelter Manager made it a point to be the first to taste the second drum that was opened and say that it was noticeably better (although he admitted that it tasted the same). He noted that the shelterees agreed, and afterward he had no further problems with the water.

Detailed Shelter Manager reports may be found in previous Final Reports.

## II. Experimental Study VI

In the 300-person study, ES VI, an eleven-man trained staff was used giving a shelter management staff/shelteree ratio of approximately 1:27. An experimental handbook was written specifically to be used by the staff during this study. The Handbook was designed to enable a minimally trained staff to organize and operate a 300-man shelter. The Handbook contained information on entry procedures, management supplies and physical facilities, duties of the various staff members, recreational suggestions, training lectures, and a shelter activity schedule.



Table 69 presents ES IV staff characteristics and positions. For purposes of evaluating prospective management candidates, rating scales and a questionnaire were used. The questionnaire tapped experience, group leadership and solutions to several hypothetical shelter problems, e.g., "You note that shelter food and/or water rations are not holding out as they should--that supplies beyond the allotted amount are disappearing."

The staff received training on two consecutive Saturdays. Topics included experimental objectives, past research (including a film of a previous study), and the Handbook. As in previous studies, written reports were submitted by all members of the management staff within ten days after study completion.

Several observers commented that the Shelter Manager was not sufficiently forceful and was unable to control the shelter effectively. Comments on the Director of Operations were generally favorable. The Director of Supply and Maintenance and Section Leaders could have delegated more of their duties; and, in general, there were problems of communication among staff members.



### III. Conclusion

The testing of a shelter handbook by CDR-trained management furnished the basis for the compilation of a handbook for use by untrained management.

## Chapter 8 - Untrained Shelter Management

### I. The Shelter Situation

Presently, approximately one hundred and thirty-seven million fallout shelter spaces have been identified. Of this number thirteen million have been marked and stocked. A crucial factor affecting the potential successful utilization of the fruits of this massive effort concerns the shelter leadership available to manage community fallout shelters.

Increasing emphasis is being placed on shelter management as a necessary counterpart to marked and stocked shelter spaces. Civil Defense Research at the University of Georgia was originally delegated the dual role of investigating the adequacy of OCD stocked supplies and the sociological and psychological factors emerging under the austere conditions of shelter confinement. However, in the spring of 1964 attention shifted to a more definitive concern with shelter management.

It is obvious that the ideal situation would be to have a trained shelter manager and a shelter staff assigned to each shelter, to have them all reach the shelter in time of attack, and to have them begin immediately and effectively to accomplish all vital tasks. At the present time, however, the number of trained and assigned shelter managers and other shelter staff members does not begin to approach this ideal situation. Even if an adequate number of personnel was trained and assigned to shelters, it is very unlikely that they would all reach their shelters in time of attack, and many of those who reached their assigned shelters could arrive late. At a given time of day or year, how many of these trained personnel would be out of town, ill, or caught in traffic and thus be prevented from reaching their shelters? Or, if some trained staff arrived late, would they find panic, confusion, or hysteria prevalent in their shelters?

The basic orientation of the research effort at the University of Georgia has been to prepare for the ultimate and most realistic nuclear emergency situation, assumed to be one in which the civilian population will enter community fallout shelters without a sufficient number of trained managers to effectively operate the shelters already marked and stocked. A shelter handbook, appearing to be one means of alleviating this problem of ill-preparedness in that it could be used as an aid to previously trained management or as a guide for leadership in a shelter having no trained management, has been written and continually tested and revised through the use of untrained shelter staffs in four of the five large group studies and in one of the small group two-week studies conducted by CDR. It is with untrained management and its use of the handbook that this chapter is concerned.



## II. Experimental Study V

Trained shelter managers in earlier CDR experimental studies (ES I-IV and ES VI) received pre-confinement training concerned with a general orientation to civil defense, former shelter habitability research, shelter staff structure and responsibilities, in-shelter programs, experimental design and procedures, and shelter equipment and supplies. They were primarily oriented to the experimental requirements of the specific studies in which they would participate. However, in ES VII, VIII, IX, and X the shelter staff received no prior training; and in ES V, although designated before confinement, the manager received no specific management training. The ES V manager briefing consisted of the experimental aspects of the study but included neither familiarization with the equipment, the supplies, nor the shelter. In lieu of the training which previous managers had received, the manager for ES V was permitted use of a shelter management handbook stocked in the shelter. This handbook was designed to assist an untrained manager in organizing and operating a small community fallout shelter. It contained an activity and training schedule as well as suggested recreational and training material. As indicated by his post-study report the shelter manager believed the handbook to be adequate and that the average person could use this handbook to set up a routine for shelter living with very little difficulty. Staff observers noted, however, that many modifications were necessary.

## III. General Emergent Management Organization (ES VII-X)

ES VII was the first large confinement study conducted by CDR utilizing an emergent untrained management staff which functioned only with the aid of a handbook. Three staffs were utilized--a temporary, a permanent, and an alternate staff. Each was composed of shelterees who had received no training from CDR. The staffs were voluntary and methods of obtaining them differed. Later, the handbook for ES VIII-X also provided for three staffs, untrained and voluntary; but, primarily because of the brevity of these latter studies, only the temporary and permanent staffs were actually selected and actually did function.

Although various parts of these sections were revised from study to study, the handbook utilized by staff members in ES VII and VIII was composed of entry phase, transition phase, and permanent phase sections. In ES IX and X the entry and transition phases were considered a single phase, and will be discussed as the temporary phase.

Basically, the temporary phase was to provide for the accomplishment of the following objectives: (1) the immediate assumption of command and formation of a management staff, (2) simplicity in staff structure with only essential staff positions and a short chain of command, (3) speed in organization, (4) completion of vital tasks in order of priority, (5) fairly orderly entry of shelterees, and (6) rapid selection of a permanent staff from the best qualified people.

As the first shelterees entered the shelter in ES VII-X, a sign, conspicuously posted, directed them to the location of the handbook, with additional instructions to follow the directions on the front of the handbook box. In ES VII the first adult male to find the handbook became Temporary Shelter Manager. In ES VIII the triumvirate shelter manager system was introduced, for the purpose of ensuring immediate assumption of shelter leadership. The first three adults to find the handbook were to be the Temporary Shelter Managers, each having overlapping duties. In ES IX and X the triumvirate system was maintained, again providing for the first three adults to find the handbook to become Temporary Shelter Managers. Even though each manager performed mutually exclusive duties in these latter tests, a cross-check system was provided.

The first instructions for the Temporary Shelter Managers in ES VII and VIII were to pass out job leaflets to people entering the shelter who would accept them. Inside each pamphlet was the request that the leaflet be returned if the recipient did not wish to do the job. If the shelteree kept the pamphlet he automatically became a member of the shelter staff. See Figures 10 and 11 for the number of operational staff recommended by the handbook during the entry phase for ES VII and VIII. In ES IX Shelter Manager 1 was directed to hand out staff instruction sheets to people willing to do the job and to tell each person the importance of following his instructions and completing the job immediately.

The ES X handbook directed that any one of the Shelter Manager triumvirate announce immediately to those already in the shelter that nine adults with at least a high school education--preferably men--were needed immediately to carry out jobs necessary for the survival of all.

Admittedly, a temporary phase implemented by untrained persons using only a handbook may be disorganized and difficult to get underway for several reasons: (1) motivational problems involved (getting naive, untrained occupants to assume task responsibilities), (2) difficulties



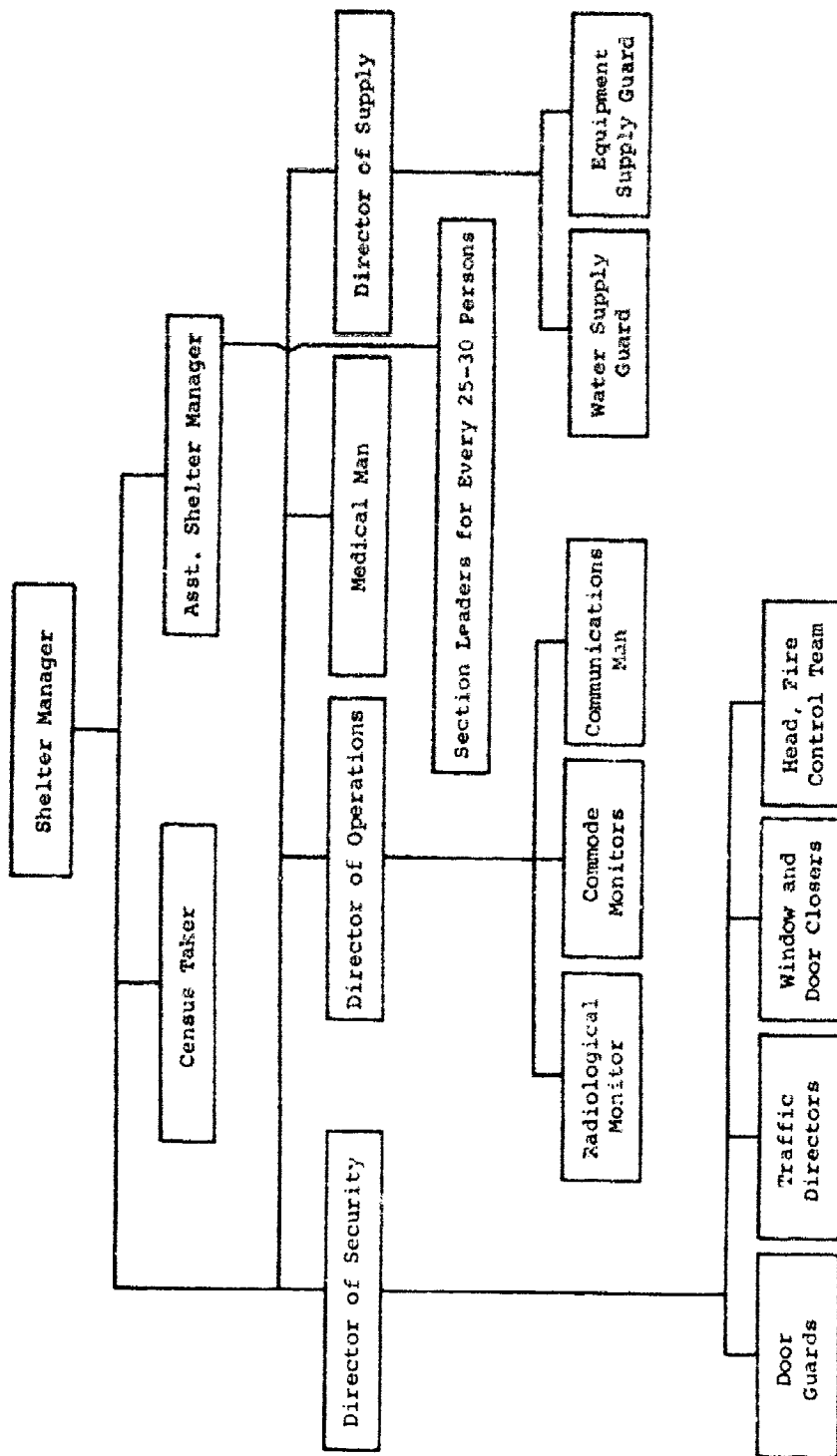


Figure 10. Temporary staff structure (ES VII).

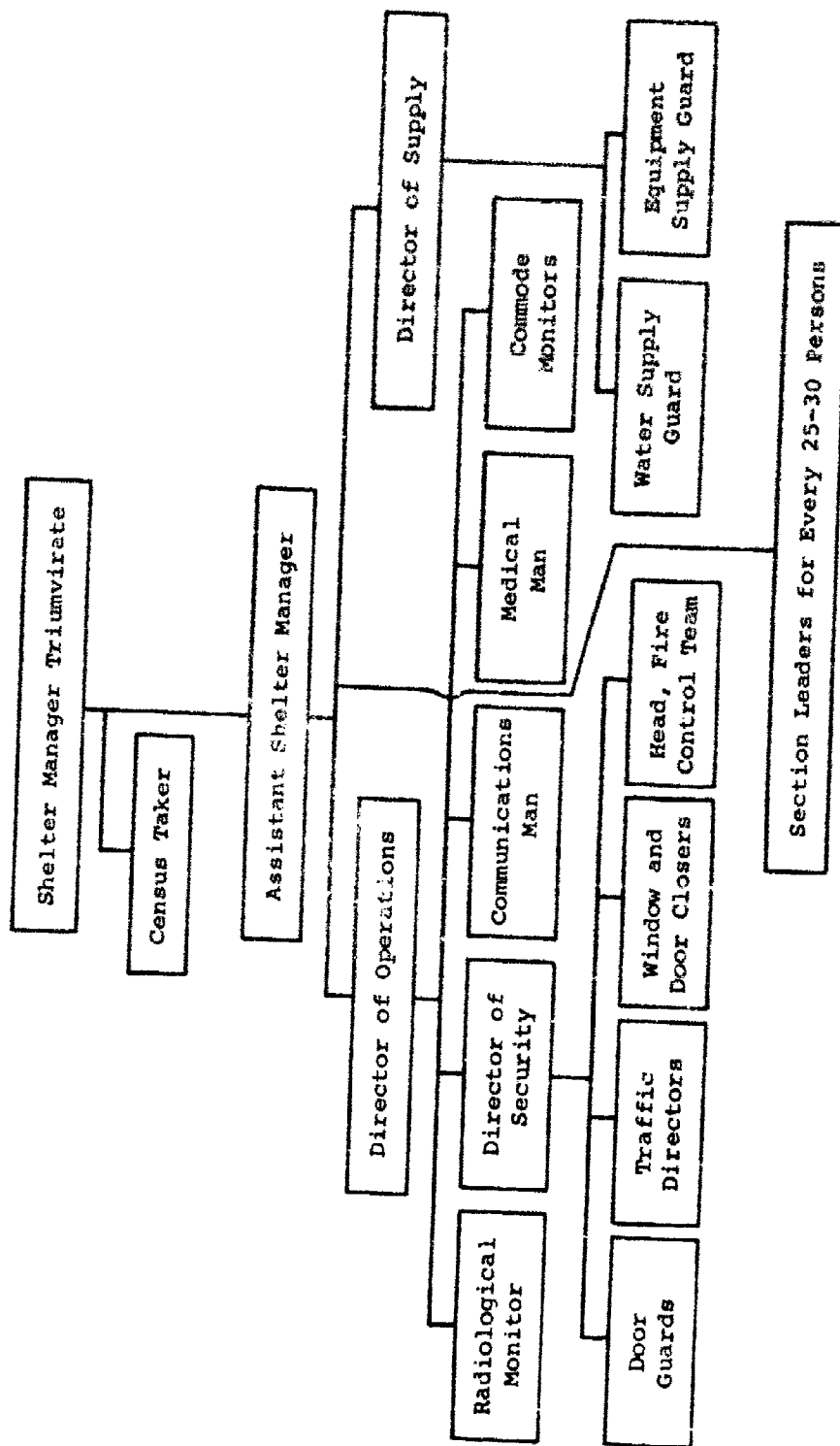


Figure 11. Temporary staff structure (ES VIII).

of communication (reading and understanding instructions and having others carry them out), and (3) problems of organization (establishing the number of vital positions and operations to be implemented during this phase).

#### IV. Experimental Study VII Management

##### A. Entry Phase

The temporary staff in ES VII did not begin to function until approximately forty minutes after entry. Shadow staff observations attributed this to the incompetence of the Temporary Shelter Manager. He did not pass out the job envelopes at the door as his handbook instructions had indicated, but instead kept the entire handbook and read all of his instruction packet at this time, a procedure unnecessary in initiating shelter management. An additional factor was his apparent startle reaction to the filming procedures used by the photography crew. After approximately thirty minutes had passed, several other shelterees gathered around the Temporary Shelter Manager to help him decide on a course of action. The instruction envelopes were then passed out and recipients began to read them. Because of this delay all of the shelterees were in the shelter before management began functioning (shelterees were phased in by busloads).

The Temporary Shelter Manager in this study did not follow all of his instructions. He did not utilize the recommended number of personnel for his staff. Room leaders, rather than Section Leaders, were used in the four shelter rooms, creating a problem of apportionment. The two largest rooms contained more people than one person could effectively control. The exact number of persons on the temporary staff could not be determined by observation, but obviously it was less than the recommended number. The recommended ratio of Section Leaders to shelterees is 1:25. The entry phase had a ratio of approximately one Section Leader to seventy-four shelterees.

Possible reasons for the insufficient number of Section Leaders in the entry phase are: (1) lack of understanding by the Shelter Manager of the importance of Section Leaders, (2) lack of qualified people from whom to choose, and (3) reluctance of shelterees to volunteer and accept responsibility. Overall, many handbook instructions concerning shelter entrance and formation of sections were not accomplished. Only 49% of the handbook's temporary phase instructions were completed, with an average rating on these completed items between "poor" and "fair." The Temporary Shelter Manager completed only 22% of his instructions during this phase, with a mean rating between "bad" and "poor."

## B. Transition Phase

After initial organization of the shelter and completion of vital tasks the last duty of the temporary staff in ES VII-X was to select a permanent staff (see Figure 12) to function for the remainder of the shelter stay. The selection was accomplished by means of data obtained from the Shelteree Information sheets in ES VII and VIII contained in each Section Leader's leaflet and cards in ES IX and X in one of the Shelter Manager's packets. This information included shelteree occupations and skills, and these qualifications were to be matched, when possible, with the suggested criteria of experience for each job in the permanent phase. The qualified shelterees were then to be asked to accept jobs. If willing, they were to receive instruction leaflets containing duties of the permanent shelteree staff.

The fact that the transition phase for ES VII began approximately four hours after shelter entry, two hours later than the predicted time for the initiation of this phase, was due, at least in part, to a lack of understanding by the Temporary Shelter Manager. Although he did not grasp the full purpose of the transition phase, the Temporary Shelter Manager did complete 78% of his transition phase tasks.

## C. Permanent Phase

Regarding staff structure in the permanent phase, handbook recommendations and what actually occurred varied in the following areas: (1) the sex, age, and experience of the permanent staff member (see Table 70), (2) the number of personnel used on the staff, (3) the composition of the selection committee for the permanent staff, and (4) the Advisory Council.

In ES VII adult men were suggested for most of the staff positions. However, two female teachers served as Director of Activities and Director of Training, and two of the Section Leaders were teenagers, both selected by necessity, since many adults, both male and female, refused to accept the positions. The manner in which the Temporary Shelter Manager organized the shelterees into room groups apparently influenced the permanent staff; considerably fewer Section Leaders were used than was advised. The permanent and alternate staffs each had seven Section Leaders, a 1:42 Section Leader to shelteree ratio. Not enough emphasis was given to selecting capable persons for the Section Leader positions in the permanent phase, possibly a reason for their mediocre job performance. The Section Leaders' main problems in establishing their authority were: (1) adults did not respond to teenagers, (2) shelterees failed to receive information, and (3) those appointed or selected did not exert leadership. Apparently only three or four of the seven Section Leaders actually performed or attempted to perform their

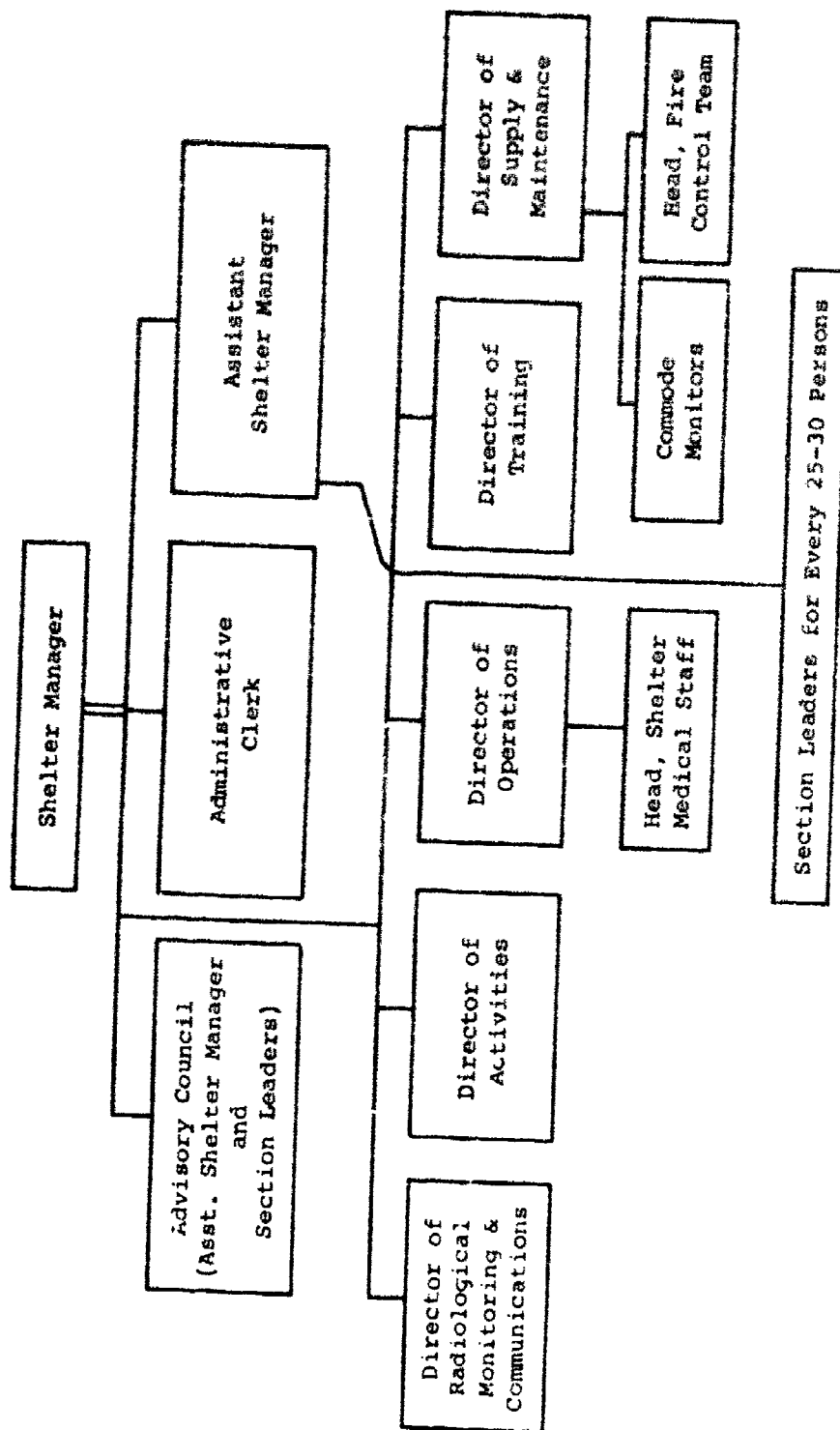


Figure 12. Permanent staff structure (ES VII-X).

Table 70  
Characteristics of Unarmed Personnel  
Shelter Staff Members  
(IS V, VII, VIII, IX, and X)

Experimental Study	Shelter Staff Position*	Age	Sex	Educational (Years)	Occupational Background	Marital Status	Number of Children	Number of Family Members in Shelter	Handbook Recommended Qualifications
IS V IS VII	Shelter Manager	31	M	16	Naval Officer	M	0	0	
	Shelter Manager	32	M	16	Manager, finance company	M	2	3	Man with proven leadership ability, dependability, and administrative background
	Assistant Shelter Manager	36	M	12	Utility operator	M	4	1	Same
	Administrative Clerk	26	F	10	Housewife	M	1	1	Same
	Director of Radiological Monitoring and Communications	30	M	18	Student	M	3	4	Man with science and technical training
	Director of Activities	34	F	16	Teacher, elementary school	M	1	1	Man with a background in physical education or social work
	Director of Operations	33	M	12	Foreman, Highway Department	M	4	2	Man with supply handling experience or training in management
	Director of Training	35	F	16	Teacher, kindergarten	M	2	2	Man with teaching experience
	Director of Supply and Maintenance	36	M	12	Insurance adjuster	M	5	6	Man with supply handling experience or training in management
	Section Leader	34	M	12	Cabinet designer	M	2	1	Man with proven leadership ability, dependability, and administrative background
	Section Leader	22	M	12	Poultryman	S	0	0	Same
	Section Leader	27	M	12	Meat cutter	M	4	5	Same
	Section Leader	47	M	9	Barber	M	4	4	Same
	Section Leader	47	M	11	Sales clerk	M	2	4	Same
	Section Leader	24	F	9	Student	S	0	2	Same
	Section Leader	18	M	9	Student	S	0	1	Same
IS VIII	Shelter Manager	23	M	16	Naval Officer	S	0	0	Same
	Assistant Shelter Manager	30	M	17	Student	M	0	1	Same
	Administrative Clerk	31	M	12	OSAP	M	2	3	Same
	Director of Radiological Monitoring and Communications	25	M	12	Fireman	M	1	0	Person with science and technical background
	Head of Fire Control Team	25	M	12	Fireman	M	1	0	Same
	Director of Activities	22	F	12	Secretary	M	0	1	Person with background in physical education or social work
	Director of Operations	31	M	16	Naval Officer	S	0	0	Man with supply handling experience or training in management
	Director of Training	27	F	16	Housewife	M	0	1	Person with teaching experience
	Director of Supply and Maintenance	23	M	10	Naval Officer	S	0	0	Person with supply handling experience or training in management

(Contd.)



Table 10 (Contd.)

Experimental Study	Shelter Staff Position	Age	Sex	Years- Fire (Years)	Occupational Background	Marital Status	Number of Children	Number of Family Members in Shelter	Handbook Recommended Qualifications
288 VIII)	Section Leader	29	F	12	Housewife	M	3	4	Person with proven leadership ability, dependability, and administrative background
	Section Leader	19	M	9	Student	S	0	1	Same
	Section Leader	37	M	20	Physiologist	M	5	6	Same
	Section Leader	23	M	16	Student	M	0	1	Same
	Section Leader	17	F	11	Student	S	0	2	Same
	Section Leader	37	F	11	Assistant city clerk	M	0	0	Same
289 IX	Section Leader	50	M	24	Executive	M	5	2	Same
	Section Leader	42	M	22	Air traffic control	M	4	4	Same
	Shelter Manager	37	M	16	Production control supervisor	M	1	1	Person with highest leadership or administrative background or highest held military rank
	Assistant Shelter Manager	49	M	18	Teacher	M	3	4	Same
	Administrative Clerk	22	F	12	Secretary	M	0	1	Person with a background in secretarial work
	Director of Radiological Monitoring and Communications	24	M	12	Mechanic	M	0	1	Person with most education in science
	Director of Radiological Monitoring and Communications	27	M	12	Deck foreman	M	0	1	---
	Head of Fire Control Team	42	M	17	Research engineer, CERA	M	4	1	---
	Director of Activities	23	F	15	Teacher	M	0	1	Person with a background in teaching, physical education or social work
	Director of Operations	31	M	14	Student	M	4	1	Person who has had military experience or a background in teaching or science
	Director of Training	24	M	16	Student	M	0	1	Person with teaching or scientific background
	Director of Supply and Maintenance	30	M	9	Fireman	M	1	3	Person with supply handling experience, military or management training
	Director of Supply and Maintenance	26	M	16	Naval Officer	M	0	0	---
	Section Leader	21	M	16	Student	M	0	0	Person with highest leadership or administrative background or highest held military rank
	Section Leader	22	M	15	Student	M	0	1	Same
	Section Leader	20	M	12	USAF (E.M.)	M	0	1	Same
	Section Leader	45	M	12	USA (E.M.)	M	3	1	Same
	Section Leader	29	M	17	Student	M	2	3	Same
	Section Leader	29	M	10	Foreman	M	4	5	Same
	Section Leader	44	M	11	Asst. manager	M	2	3	Same

(Contd.)

Table 70 (Contd.)

Experimental Study	Shelter Staff Position*	Age	Sex	Education (Years)	Occupational Background	Marital Status	Number of Children	Number of Family Members in Shelter	Handbook Recommended Qualifications
SS 2	Shelter Manager	34	M	11	Civil defense director	M	3	4	Person with leadership or administrative background or high military rank
	Assistant Shelter Manager	26	M	11	USAF	M	0	1	Same
	Administrative Clerk	34	F	14	Secretary	M	3	3	Person with background in secretarial work
	Director of Radiological Monitoring and Communications	32	M	18	Technical publications supervisor	M	1	2	Person with most years of education in science
	Head of Fire Control Team	24	M	15	Student	S	0	1	Person with knowledge of fire-fighting
	Director of Activities	25	M	13	Student	M	1	2	Person with background in teaching, physical education, or social work
	Director of Operations	33	M	17	Student	S	0	0	Person with leadership or administrative background or high military rank
	Director of Training	33	M	17	Student	S	0	0	Person with scientific background, preferably with teaching experience
	Director of Supply and Maintenance	34	M	15	Banker	M	4	5	Person with leadership or administrative background or high military rank
	Section Leader	23	F	16	US Forest Service Research Lab.	M	1	2	Same
	Section Leader	41	M	12	Plumber, city	M	3	4	Same
	Section Leader	34	M	17	Accountant	M	3	4	Same
	Section Leader	34	M	23	Salesman	M	2	3	Same
	Section Leader	22	M	16	Student	S	0	0	Same
	Section Leader	44	M	11	Public Health Sanitarian	M	4	4	Same
	Section Leader	17	M	11	Student	S	0	4	Same
	Section Leader	27	M	16	Student	M	0	1	Same
	Section Leader	27	M	17	Student	M	1	0	Same
	Section Leader	32	M	16	Industrial engineer	M	2	3	Same
	Section Leader	43	M	16	Insurance claims supervisor	M	3	4	Same

\*Permanent phase medical staffs in all studies were pre-selected and briefed by CMB, and are not listed in this table.

\*Same shelterees served in both capacities.

\*Replacement for the first Director of Radiological Monitoring and Communications who defected.

\*Replacement for the first Director of Supply and Maintenance who defected.

\*Same shelterees served in both capacities.

jobs. For all practical purposes, the shelter operated with only four Section Leaders, one for each room. The configuration of the shelter, two floors with a total of four rooms, undoubtedly influenced this kind of grouping. The problem inherent here was one of apportionment, since the rooms were unequal in size. Each of the two small downstairs rooms contained about thirty-five persons, the large downstairs room about one hundred and forty persons and the upstairs room about ninety persons. Consequently, the efficiency of the performance of the Section Leaders was greatly attenuated.

Overall, the permanent staff performed 33% of their handbook tasks with a mean rating between "fair" and "average."

#### D. Advisory Council and Alternate Staff

The formation of an Advisory Council, to consist of Section Leaders and the Assistant Shelter Manager, is a handbook suggestion. Its intended purpose is to furnish the Shelter Manager with information about problems confronting the shelterees. Unfortunately, the Advisory Council did not function in ES VII. Apparently, the Assistant Shelter Manager and the Section Leaders did not completely read their instructions or chose to ignore the suggestion.

The selection of the alternate staff to relieve the permanent staff did not occur until the fifth day of the study, possibly because of the lack of emphasis in the handbook supplement, which may have been regarded an optional guide to the handbook. (The handbook itself did not emphasize the organization of an alternate staff, and the plan for the organization was included in the supplement in a section also presenting many suggested functions.)

By the fifth day of confinement the permanent staff members were apparently sufficiently acquainted with other shelterees to determine who was capable of assuming the responsibility of staff positions. Once alternate staffing was begun, the suggested plan in the supplement was in the main followed.

Each permanent staff member, using appropriate sections of the handbook, trained his alternate for approximately an hour. The transition from the permanent to the alternate staff was accomplished on the sixth day of confinement.

There was no rotating shift schedule set up for permanent and alternate staffs. The permanent staff had been on duty for five days and there were only two occupancy days left in which the alternate staff was to function.

## V. Experimental Study VIII Management

### A. Entry Phase

The shelter handbook, revised on the basis of ES VII observations, was again used in ES VIII. The first three women to enter the shelter read the instructions on the handbook. Only one of these women accepted any responsibilities, thus functioning as a single Temporary Shelter Manager. The handbook for this study called for a triumvirate Shelter Manager system with each Shelter Manager having the same tasks to perform, creating a triple check system, giving more assurance that the vital initial tasks would be carried out. Even though triumvirate management did not materialize, the procedure resulted in at least one functioning Temporary Shelter Manager. The first male to enter became the Temporary Assistant Shelter Manager. He emerged as the spokesman for the Temporary Shelter Manager at her request, while she handed out instruction leaflets and aided in the selection of the permanent staff. Although the Temporary Assistant Shelter Manager refused the Temporary Shelter Manager's offer to accept her job, he functioned as though he had.

The Temporary Traffic Director's leaflet was given to a fourth woman who took the leaflet and read it but made no attempt to form sections and appoint Temporary Section Leaders. As a result, most shelterees congregated in the main room near the entrance. While trying to keep the crowd quiet, the Temporary Assistant Shelter Manager assumed command and set up a staff. Thus, he discharged tasks such as (1) making announcements to the shelterees, (2) coordinating the shelter staff, and (3) making decisions. He used the handbook as a guide, but for the most part made decisions on his own.

The major problem encountered during the entry phase was the failure of several people to carry out their prescribed duties. The Temporary Traffic Director, for instance, failed to form sections, appoint Temporary Section Leaders, and keep shelterees away from the entrance. There was also some confusion surrounding the Temporary Communications Man. The person initially receiving the instruction leaflet for this position did not assume the responsibility. The woman first answering the EOC phone fulfilled the function, and therefore served as the Communications Man. Other areas of confusion centered around the Temporary Water Supply Guard and Temporary Equipment Supply Guard positions. Twenty minutes after all leaflets had been passed out, there was still no functioning Temporary Water Supply Guard.

In contrast to the ineffectiveness of these positions was the ability and initiative shown by the Temporary Assistant Shelter Manager. Although he seemed at first reluctant to accept the position, he apparently realized it was necessary to begin operations immediately. While the Temporary Shelter Manager was passing out handbook leaflets, the Temporary Assistant Shelter Manager began to organize the entry phase and coordinate the staff.

Due to the initial confusion surrounding the Temporary Traffic Director, the sections were oversized, averaging forty-two shelterees per section as contrasted with the twenty-five to thirty suggested in the handbook. After operations began to run more smoothly, the Temporary Assistant Shelter Manager reorganized the sections to form more workable groups, averaging approximately thirty-three shelterees per section. Once set up, the temporary management staff worked smoothly and began preparations for starting the permanent phase. Although holders of several positions were not functioning as desired, the leadership ability and initiative of the Temporary Assistant Shelter Manager were sufficient to overcome these problems.

Approximately 66% of the handbook's temporary phase instructions were completed. The average rating of those tasks completed was between "average" and "good." When compared with ES VII in this area, it is evident that the temporary phase was implemented more efficiently in ES VIII.

#### B. Transition Phase

The transition phase began approximately three hours after shelter entry, an hour less than for ES VII. During this phase the Shelteree Information sheet data suggestions were followed closely in the selection of the permanent staff. In both ES VII and ES VIII this data source proved a success and greatly aided in the selection of a competent permanent staff.

The transition from temporary to permanent phase was completed approximately three and a half hours after entry. The new staff was well chosen, in accordance with the criteria outlines in the handbook (Figure 12).

Staff members were not chosen with number of children as a selection factor. Information from various data forms, however, indicates that number of children was a factor considered by permanent staff members before they accepted their positions. Apparently, those shelterees with children in the shelter felt their first duty was to their families.

#### C. Permanent Phase

The permanent staff assumed command easily and without incident. For the most part, they followed the handbook closely. The main differences in the suggested and actual staff structure were the slightly enlarged sections, and a combining of two staff positions under one person--Director of Radiological Monitoring and Communications and Head of the Fire Control Team. Another variation in the suggested structure was the lack of a functional Advisory Council, possibly considered unnecessary for the short shelter stay.

The permanent staff followed the handbook more closely than did the temporary staff. The former staff had the advantage of inheriting a comparatively orderly shelter program already in progress, and more time to refer to the handbook for guidance. The permanent staff performed approximately 64% of their tasks with a mean rating between "average" and "good."

Due to the brevity of ES VIII, no alternate staff was formed, as mentioned earlier. However, assistants for each shelteree staff position were selected in anticipation of this next step in staff organization.

#### VI. Comparison of ES VII and ES VIII Management

With regard to overall management efficiency, there were four primary differences between ES VII and ES VIII:

1. ES VII was a one-week study; ES VIII was a weekend study.
2. Shelterees in ES VII were told about the handbook in a talk before entering the shelter; shelterees in ES VIII were told about the handbook, but more emphasis was placed on the fact that they would have to assume job responsibilities and run the shelter themselves.
3. The handbook in ES VII was changed for ES VIII in that instructions were simplified and shortened for all staff positions.
4. The proximity of the camera crew in ES VII had a noticeably adverse effect on the Temporary Shelter Manager in that study.

The reasons for the observed improvements from ES VII to ES VIII are thought to be a combination of the four differences previously stated.

#### VII. Experimental Study IX Management

##### A. Temporary Phase

The triumvirate temporary manager system was again used in ES IX, with a revision, mentioned previously, that provided each Shelter Manager with personal independent tasks to perform. This system worked extremely well in ES IX, and the successful, efficient implementation of this procedure might be attributed to several factors: (1) All three temporary managers were previous acquaintances, (2) All three managers had completed four years of college and all scored well above average on the MMPI Leadership Sub-Scale, (3) ES IX was conducted in one room only, (4) This study was the smallest of all large group studies (160 persons as opposed to 300 in ES VII and VIII and 504 in ES X), and (5) Motivation of volunteers serving as shelter staff.

The handbook was opened three minutes after shelter entry, and Temporary Shelter Manager 1 asked for eight volunteers who could read to come forward. Eight persons volunteered and thus, staff leaflet distribution was completed within eight minutes of entry.



The temporary staff structure (see Figure 13) was adequate, in spite of a few mistakes made during operations. With the exception of the two Radiological Officers who could not carry out all their tasks because of faulty equipment, the eleven member temporary staff performed their duties within two hours.

The Information Cards used to select the permanent staff were distributed, filled out, and returned within forty-five minutes after shelter entry. Instructions on these cards were not clear to some shelterees, but they were correctly followed by most of the temporary and permanent staff.

The method of selection of the permanent staff was successfully implemented but was somewhat lengthy. The first staff member selected was the physician; other selections were made in the recommended order and were completed one hour and forty-six minutes after entry.

#### B. Permanent Phase

The permanent staff structure was adequate, but it was found that individual instructions were in need of further improvement. As in the temporary phase, individual staff initiative and leadership ability contributed strongly to the success of the permanent phase.

### VIII. Experimental Study X Temporary Phase

Even though handbook instructions were not followed regarding the method of obtaining staff members, with the exception of the Temporary Security Officer, all temporary officers at least attempted to complete their duties. The handbook instructed that temporary staff recruitment be done on a voluntary basis rather than randomly assigning or appointing officers, as was actually done in ES X.

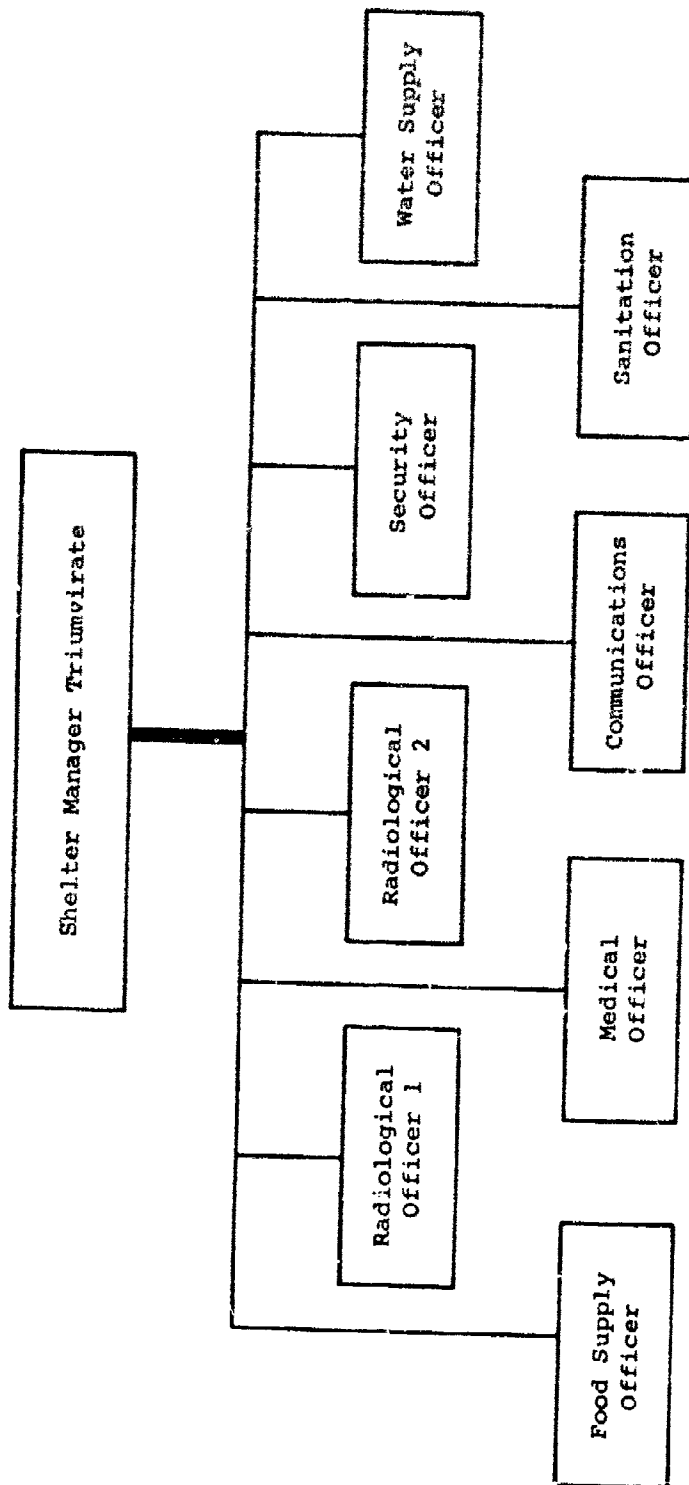


Figure 13. Temporary staff structure (ES IX).



Two prominent problems encountered during the temporary phase were apparently a result of misinterpreting or ignoring handbook instructions. Temporary Shelter Manager B attempted to retain all shelterees in the one large room of the shelter. This action led to extreme overcrowding which contributed to some early defections, difficulty in supply movement, increased congestion around entry ways and uncomfortable temperature and humidity levels in that room.

Another problem arose when Temporary Shelter Manager C, ignoring handbook instructions, incorrectly opened the permanent phase portion of the handbook and began to distribute permanent staff leaflets to members of the temporary staff. This error was compounded when the temporary staff attempted to fulfill these duties as well as their own, even though many of these duties could not be fulfilled until certain temporary duties had been completed. This error also resulted in certain leaflets being unavailable at a later time when the permanent staff was selected.

In preparation for the initiation of the permanent phase, Temporary Shelter Manager B followed handbook instructions regarding the utilization of completed Information Cards to select prospective permanent staff members. However, she was faced with two problems in the formation of the permanent staff: (1) many people selected were difficult to find in the large, crowded downstairs room, and (2) some selections defected and required replacement. Later examination of staff members indicated, as in previous studies, that the Information Card method of selection was effective. After the permanent staff had been selected, several of the directors further used the cards to select assistants designated in their instruction leaflets. Two directors had no leaflets at the beginning of the permanent phase, due to the above mentioned problem, but they were soon recovered. Permanent staff morale seemed to be dampened by this occurrence as well as by the over crowding in the large room. In addition, defections continued to plague the permanent staff.

Only about half the number of Section Leaders suggested by the Handbook were appointed. Seven Section Leaders were selected on the evening of entry giving a ratio of seventy-one shelterees per section rather than the suggested twenty-five to thirty person sections.

For further details on ES X management see section appearing earlier in this report.

## IX. Management Efficiency in the Large Group Studies

### A. Temporary Phase

The mean percentage of tasks completed in the temporary phase of ES VII, ES VIII, and ES X varied from 49% to 66%. (See Table 71.) There was only a slight difference in the efficiency of the temporary staffs in ES VIII and ES X, the two large groups, multi-room studies

Table 71  
Mean Percentage of Tasks Completed  
by the Shelter Staff  
(ES VII, VIII, and X)

Time	Percentage of Tasks Completed		
	ES VII	ES VIII	ES X
Temporary Phase, Friday	49	66	63
Beginning of Permanent Phase, Friday through Saturday	33	63	38
Sunday	44	67	39

using triumvirate Temporary Shelter Managers. There was a much greater difference in the percentage of tasks completed between these two studies and ES VII, which used a single Temporary Shelter Manager. This would seem to indicate that the triumvirate system is preferable to a single Shelter Manager for the successful completion of tasks during the temporary phase.

#### B. Permanent Phase

A drop in the mean percentage of tasks completed occurred from the temporary phase to the permanent phase in all studies. (See Figure 14.) This decrease was less in ES VIII than in the other two studies. This may be due to the fact that in this study a number of shelterees who were on the temporary staff were also on the permanent staff. A rise in the mean percentage of tasks completed was noted from the Friday night-Saturday time period to Sunday in all the studies. This rise is marked in ES VII, but very slight in ES VIII and X.

It is not possible to clearly separate the variables causing the difference in the percentage of tasks completed in the various studies. However, an increase in the size of the shelter population to 500 persons (ES X) did not noticeably affect the efficiency of the temporary phase staff. It is possible that this increase did affect the efficiency of performance in the permanent phase.

#### X. Organizational Problems In Large Group Studies

One particular aspect of the later shelter studies has been an increasing emphasis on shortening the temporary phase time. Such changes in handbook instructions as the triumvirate Shelter Manager arrangement and the introduction of 3" x 5" Information Cards have greatly aided in the realization of this goal, making it possible to assemble the permanent staff in less time.

Figure 15 indicates that the duration of the entry (temporary) phase has declined from ES VII when it lasted four hours to less than two hours in ES IX. Although ES IX was a one-room, 160-person study, the same trend is evidenced in the most recent 504-person study (ES X).

Confounding variables such as square feet per person, number of rooms, and efficiency of individual temporary officers make it impossible to propose a strict relationship between length of the entry phase and the number of subjects, in shelter studies conducted to date. However, it would appear that continued handbook revision has resulted in continued improvement in shelter organization.

A multi-chambered shelter, as mentioned earlier, may compound problems of organization, at least initially. How does the size of the shelter room and the number of people in that room relate to the amount

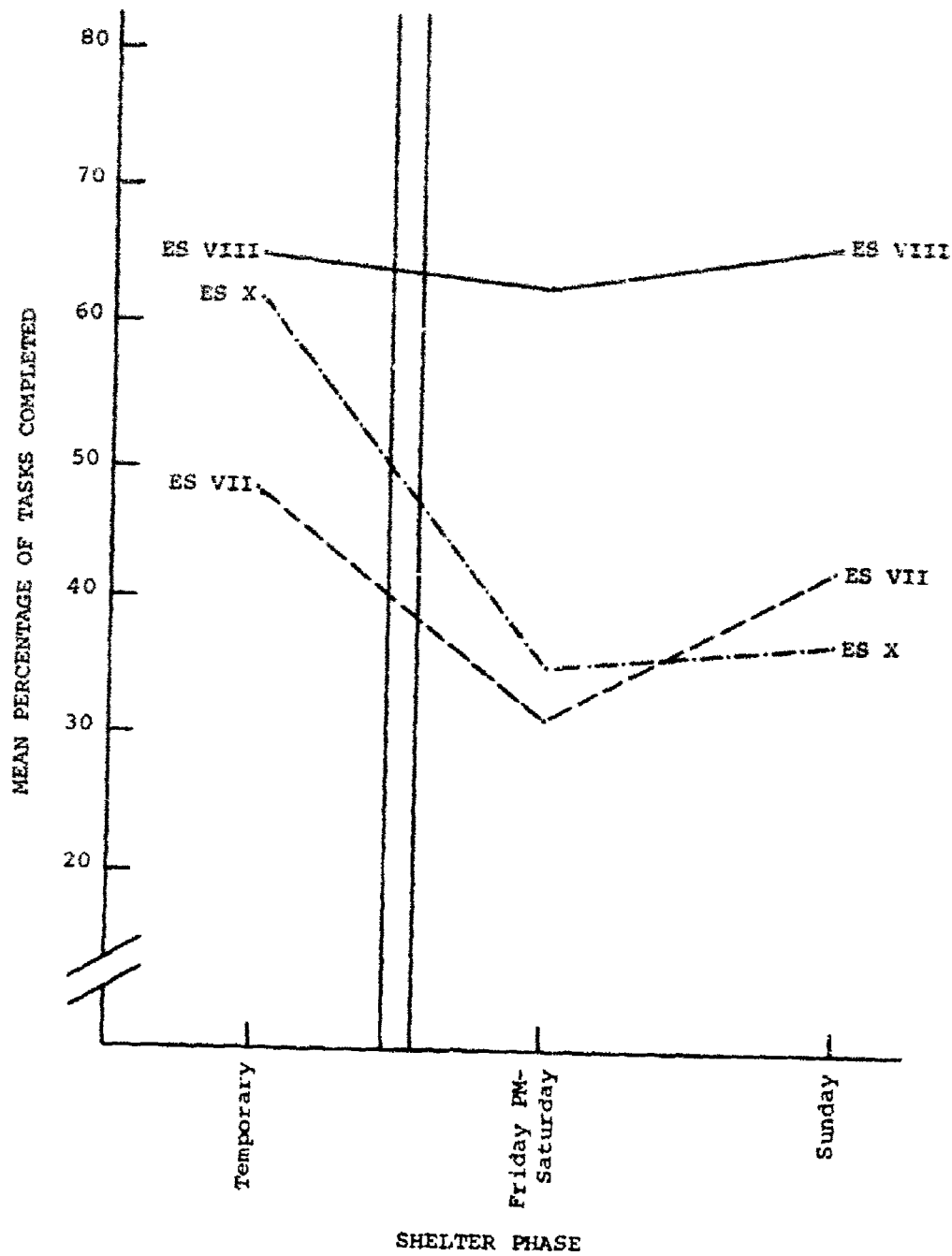


Figure 14. Comparison of Handbook tasks completed by the ES VII, VIII, and X shelter staff.

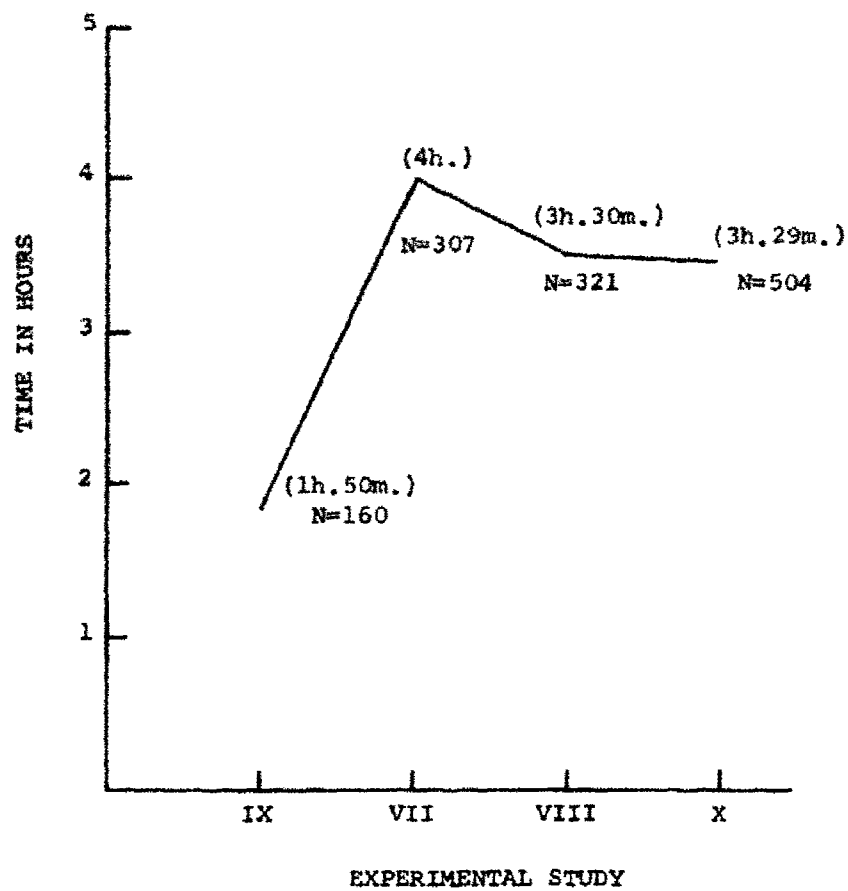


Figure 15. Length of entry (or temporary) phase of Experimental Studies VII-X in order of increasing size of shelter population.

of time it takes for the room to become organized? Organization involves three factors: (1) whether or not the assigned capacities of various shelter rooms have been met, (2) differential self-organization of rooms of various capacities, and (3) whether or not liaison has been established between respective shelter rooms and general shelter management. In rooms that the temporary shelter staff was not organizing itself, order usually came more quickly as shelterees found a place to put down their belongings and orient themselves. When claims for space had been staked and available space taken up with persons and their belongings, discord was sometimes caused by the addition of more shelterees and this situation was usually overcome, especially if the rearrangement was supervised by a Section Leader or other staff member. This problem occurred in ES VII and VIII in Rooms A and B and in ES X in Room D.

In contrast, rooms in which the main shelter organization took place were longer in becoming orderly. However, it is not possible to determine whether this was a function of the size of the room and the number of shelterees or of the activity that was involved in setting up shelter management and equipment such as the medical area and commode area. In all studies the main downstairs room was the last to become settled, although it was usually the first room to interact with shelter management.

In ES X the larger upstairs Room C also required longer time for organization; this factor was attributed in part to the location of the PVK, the commode area, and the food supply area as well as crowding.

A factor which might also cause a difference in time of organization is the variation between the larger and smaller rooms in the number of shelterees that come into the room after the initial influx. If new shelterees are constantly coming into the room, disorganization will very likely be the result. The length of the temporary phase influences to a great extent the organization of a room. The smaller rooms which hold fewer people take less time to be filled up; therefore they become organized sooner. In addition, in ES IX, which was held in one room, order rather quickly prevailed, possibly because all of the shelterees entered in about five minutes.

#### XI. Summary of Problem Areas of Shelter Habitation

The goal of shelter habitation is the physical survival of the shelterees. People must be taken care of in the shelter and given knowledge of how to survive once they leave.

Management and Organization: Effective management is essential to shelter life and since the responsibilities of shelter management are complex, it is important that those selected as staff have previous supervisory training. But realistically it cannot be expected that all persons selected will have such training.

In past studies a brief pre-shelter orientation address has proven helpful to temporary phase organization and has implications for mass media civil defense instruction.

Good management entails effective around-the-clock leadership. Since leadership will depend upon tacit consent of the shelterees, it cannot be totally authoritarian. Yet it is essential that the new environment be constantly defined for the shelterees. In a crisis particularly, people need structure.

A trait basic to shelter leadership is the ability to channel self-orientation and self-concern into an orientation of concern for others in the group. A particular pitfall as confinement continues is the tendency for the leader to become self-centered or to project his own feelings of lethargy, physical, and psychological discomfort to the rest of the group and thereby become desensitized to their needs. Firm, consistent leadership qualities, combined with an ability to perceive realistically both group and individual needs, are essential in management for shelter morale, unity, and wholesome shelter adjustment.

It is by their actions that members of the staff demonstrate authority and capability. If shelterees are to be motivated to endure the strains of shelter living, the staff must set the example. Motivational problems in experimental studies are obviously not as critical as those to be encountered in the nuclear situation. Shelterees in an experimental situation are aware there is no real danger. They know how long they will be confined, and that they can leave if conditions become too trying.

A well-organized shelter with activities for as many shelterees as possible will enhance morale. If the shelter population contains a large percentage of very old or very young persons, additional motivational problems will be encountered. The reaction of the children will depend to a large extent on that of the adults, e.g., manifest adult fear will be mirrored in the children. If children enter the shelter without family members or friends, management should assign "guardians" to care for them. Elderly people may find it difficult to adjust their living habits to the shelter environment.

The survival needs of infants below the age of one year and of the elderly over seventy present a broad area for exploration.

Although individual shelterees may not be flexible, management must be. When one routine doesn't work, another must be tried. Even an excellent shelter schedule may not run smoothly during the first few days of occupancy.

To maintain effective management under actual emergency confinement involving a large population, it is probable that one management staff will not be sufficient for continuous leadership responsibilities over an extended period of time. An advisable provision in shelter management organization is an alternate staff to relieve the original staff.

Chain of Command: A breakdown in the chain of command could be a serious management problem. It is essential that each staff member know his duties thoroughly and that shelterees know which staff members are responsible for what tasks.

Shelter Rules: Since many people who do not know each other are brought together in the shelter in a situation for which they have had little, if any, training, it is essential that rules be made governing every aspect of shelter life (eating, sleeping, smoking, etc.). Developing the rules is one management problem; enforcing them is another. The earlier the rules are established the better it is for both management and shelterees. On the one hand it strengthens management authority; on the other it defines the environment for shelter occupants. Rules should be limited, however, to those considered vital and necessary.



Disciplinary Problems: In larger shelters the greater number of possible anti-social problem cases indicate the feasibility of a detention area, where such shelterees could be kept for later disposition.

Early Defections: There may be shelterees who desire to leave the shelter before it is safe to do so. Management has no authority to restrain them but should nevertheless try to encourage them to stay. However, should shelterees leave and then decide to return, it must be determined that they are properly decontaminated before they are allowed to re-enter. Names of those leaving should be entered in the shelter log.

Medical Problems: Medical problems in the shelter could be the most serious that management will face, for several reasons: a) only limited medical supplies are stocked, b) there may be no medically trained people in the shelter, and c) the difficulty of control of any communicable disease. Head-toe sleeping arrangements are desirable in preventing spread of disease, but previous studies have shown people find this distasteful. Hence management must decide whether conditions warrant enforcing it throughout the shelter or enforcing it only in the medical area. It is essential that management inform shelterees of the smaller medical discomforts associated with shelter living, e.g.,



infrequent bowel movements, headaches and nausea, etc. Occupants should also be given such information as the noncontagious nature of radiation sickness. In addition to medical problems associated with the new environment, some persons will enter the shelter with pre-existent physical illnesses. Some will have medications for their condition, others will not.

Sanitation: In all studies sanitation was a problem, e.g., handling of crackers and carbohydrate supplement in an unsanitary manner, and oral suction to induce water siphoning. Food handlers should be required to sanitize their hands prior to food dispensing. The chemical commode, particularly, has been a major source of complaint. In the nuclear situation, measures must be taken to ensure the highest possible degree of cleanliness in this area.

Odors: The unpleasant odors emanating from the commodes can evolve into intense discomfort factors for the shelterees. The food dispensing station should be as far removed from the commode area as practical. Dispensing near the commode area also creates unnecessary traffic conflict between the line assembled for food and individuals making their way to the commode area.

Since there will be limited bathing facilities or none at all, prolonged confinement will confront the shelteree with the problem of body odor. This personal discomfort factor, coupled with the crowded conditions of the shelter, will be an irritant to self and others. To some extent, proper ventilation can help to alleviate this problem.

Rations: Theoretically, each shelteree is entitled to his share of food and water from the supplies stocked. But other factors should be considered. Some shelterees will have brought food and water supplies. Management can ask that these be contributed to the common stock, but should not compel shelterees to give up their personal supplies unless absolutely necessary for group survival. The amount of water necessary to maintain operational efficiency will depend upon the diet and the temperature. Those shelterees involved in the more strenuous work tasks may need more food and water than others not so assigned. Children and elderly persons may not need as many calories as those individuals of the in-between ages. It is important that guidelines for food and water rationing be set up as soon as possible, particularly if it is believed the shelter stay may be lengthy.

Pets: Some shelterees might bring pets to the shelter. Because of their food consumption, animals may jeopardize vital food stocks, and consequently should not be allowed in a shelter. Doubtless some shelters will have an adjacent place where animals may be kept but, even so, there is still the problem of food and water availability.

Space: Shelterees have complained of the lack of facilities for the storage of personal items, and have mentioned the need for racks. Such vertical storage would remove the clutter from the living area and allow for safer passageways.

Temporary Exits: There will be temporary exits from the shelter, especially during the early stages of habitation, in order to find various essential supplies. Yet shelterees should not be allowed to leave temporarily unless necessary. The level of fallout in the area will determine the number of temporary excursions to be allowed.

Fire: Fire could be a shelter hazard. Provisions should be made for fire drills, and escape routes should be well defined to avoid the chaos of mass exit.

Shelter Temperature: Shelter temperature, either too warm or too cool, was a discomfort factor in all studies. However, it is impossible to maintain a temperature satisfactory to all inhabitants. Even so, such devices as the PVK are helpful to proper ventilation.

Nursery: Several studies have organized nurseries to free parents to attend training sessions. In a real emergency such an organization would be helpful in this regard, and also as an opportunity to give instructions to children.

Exercise: For the most part, the majority of shelterees tend toward immobility. Some form of exercise is vital to their physical and psychological well being, and, whether formal or informal, should be encouraged. Recreation is also important in preventing apathy.

Pre-existent Problems: In addition to the problems stemming directly from shelter living, the management will be faced with individual problems which existed prior to shelter entry. For example, there may be one or more alcoholics entering the shelter. Should management confiscate alcohol in their possession? If the person is without a supply he may try to drink other substances or he may want to leave the shelter in search of supplies. In any problem such as this in which there is no definitive answer the only guideline can be that management must decide what is best for the majority of the shelterees. In any case, if the shelteree becomes a threat to others, some kind of containment action is indicated.

## XII. Conclusions

### A. The Shelter Situation

There is a need for a stocked handbook to help shelter occupants establish shelter organization, in the possible absence of OCD-trained leadership.

## B. General Emergent Management Organization

1. A temporary and permanent staff organization format proved functionable in several large group occupancy tests.
2. The brief pre-shelter orientation address, on the point of self-management with the aid of a stocked handbook, proved helpful in initiating shelter organization in the temporary phase.
3. Primary problems encountered in initial shelter organization included obtaining volunteers, implementing instructions, and intra-shelter communication.
4. The triumvirate shelter manager system facilitates the implementation of the temporary phase of shelter organization.
5. In multi-chambered shelter facilities the smaller rooms tend to become organized more quickly than the larger rooms.
6. The research prototype CDR Community Fallout Shelter Handbook for Untrained Shelter Management has been tested and found feasible.
7. The concept of an alternate staff to relieve permanent staff management has been found to be of value.
8. To the greater extent the handbook instructions are followed, the more successful is shelter management. Conversely, to the greater degree the handbook instructions are ignored, the greater the number of management and organizational problems.

## C. Shelter Habitation Problems

Areas which have, and those which may, pose shelter habitation problems for both trained and untrained management include (1) management and organization, (2) chain of command, (3) shelter rules, (4) disciplinary problems, (5) early defections, (6) medical problems, (7) sanitation, (8) odors, (9) rations (10) pets, (11) space, (12) temporary exits, (13) fire, (14) shelter temperature, (15) nurseries, (16) exercise, and (17) pre-existent personal problems.

## Chapter 9 - Shadow Staff Procedures

### I. Rationale for Shadow Staff Use

Prior to ES VII, the shelter management in each experimental study (with the exception of ES V), was trained in shelter management techniques. However, in ES VII, an untried management procedure went into effect, the shelter being staffed with volunteers from among the shelter occupants. Since ES VII was the first study without CDR selected management, precautions were taken to insure smooth shelter functioning. A shelter management staff was trained and put into the shelter to observe the emergent shelter staff, to evaluate the instructions found in the Handbook, and to assume management of the shelter if necessary. Each CDR trained shelter staff member was instructed to follow, or "shadow", the untrained shelter staff member to whom he was assigned. As inside observers, shadow staff members were able to rate the untrained management on performance, to provide information which was helpful in revising the Handbook, to evaluate the shelter command structure, and to perceive more details in the large group studies in a way inaccessible to outside observation.

Since the Handbook was found successful in the hands of an untrained management staff, the emphasis of the shadow staff changed from the role of alternate emergency shelter staff in ES VII and VIII to that of simply in-shelter observation in ES IX and X. The information provided by the shadow staff's observations has proven to be a very useful form of data collection.

### II. Qualifications of Shadow Staff

The prospective shadow staff member was evaluated on alertness, ability, initiative, and interest. With several exceptions, all members of the shadow staff had college degrees. Shadow staff characteristics can be found in Table 72. It should be noted that in ES IX and X, most of shadow staff members were CDR personnel. In ES X, previous study participants were also trained to fill some of the positions.

### III. Shadow Staff Training

For ES VII and VIII, the shadow staff received instructions similar to those which the shelter management staff received in ES VI. Training was concerned with general orientation to civil defense, former shelter habitability research, experimental design and procedures, shelter supplies and equipment, shelter command and responsibilities, and special shadowing techniques.

Table 77  
Shadow Staff Characteristics  
(NS VII-X)

Experimental Study	Shadow Staff Position		Age	Sex	Occupational Background	O.D. Training
	Temporary Phase	Permanent Phase				
NS VII	Shelter Manager	Same for all in both phases	26	M	Graduate student	EM Course
	Assistant Shelter Manager		25	M	Graduate student	None
	Director of Operations		28	M	Graduate student	Taught CD courses in Army Reserves
	Director of Supply and Maintenance		31	M	Naval Officer	None
	Director of Radiological Monitoring		34	M	Ph.D. in Mathematics; teacher	EM Course
	Director of Training		39	M	Master's Degree in Mathematics	CD Traffic Course
	Director of Activities		24	F	Teacher	None
	Section Leader		46	M	Retired Army Officer	None
	Section Leader		21	M	Graduate student	None
	Section Leader		22	F	-----	None
	Section Leader		24	M	Graduate student	None
	Section Leader		21	M	Graduate student	None
	Section Leader		22	M	Teacher	None
	Section Leader		24	F	Graduate student	None
NS VIII	Shelter Managers	Same for all in both phases	25	M	Lawyer	EM Course
	Assistant Shelter Manager		25	M	Graduate student	None
	Director of Operations		31	M	Naval Officer	None
	Director of Supply and Maintenance		30	M	Naval Officer	None
	Director of Radiological Monitoring		34	M	Ph.D. in Mathematics; teacher	EM Course
	Director of Training		46	M	Retired Army Officer	None
	Director of Activities		32	F	Housewife	None
	Section Leader		28	M	Graduate student	Taught CD in Army Reserve
	Section Leader		24	M	Graduate student	None
	Section Leader		28	M	Teacher	None
	Section Leader		23	M	Graduate student	None
	Section Leader		25	M	Naval Officer	None
	Section Leader		24	M	Graduate student	None
	Section Leader		27	M	Graduate student	None
	Section Leader		22	F	(unknown)	EM Course
	Section Leader		25	M	Naval Officer	None
	Section Leader		27	M	Graduate student	None
	Section Leader		23	M	Naval Officer	None
	Section Leader		30	F	Graduate student	None
NS IX	Temporary Shelter Manager 1	Shelter Manager	26	M	CDR	EMI, SDO
	Temporary Shelter Manager 2	Director of Activities	29	M	CDR	EMI Course
	Temporary Shelter Manager 3	Assistant Shelter Manager	25	M	CDR	CDM
	Radiological Officer 1	Director of Training	26	F	CDR	EMI, CDM
	Radiological Officer 2	Director of Operations	28	M	CDR	None

(Contd.)

Table 2 (Contd.)

Experimental study	Shelter staff positions		Age	Sex	Occupational Background	CCO Training
	Temporary Phase	Permanent Phase				
ES IX	Security Officer	Section Leader	24	M	Student	None
	Water Supply Officer	Director of Supply and Maintenance	28	F	CDR	SMI, Region III
	Food Supply Officer	Head of Fire Control Team	19	F	CDR	U.S.C.D. Council Adminstr
	Medical Officer	----	31	M	CDR	None
	Communications Officer	Administrative Clerk	31	F	CDR	SMI (2), Region III
	Sanitation Officer	Section Leader	21	F	CDR	U.S.C.D. Council Seminar
	(outside tape narrative)	Director of Radiological Monitoring and Communications	23	F	CDR	None
						SMI, SMI, MCO
ES X	Ventilation Officer	Director of Operations	29	M	Law School; recent CDR employee	None
	Communications Officer	Director of Activities	31	F	CDR	None
	Shelter Manager C	Assistant Shelter Manager	37	M	Industrial Production Control Supervisor	None
	(wireless in-shelter mike observer)	Director of Supply and Maintenance	24	F	CDR	None
	Radiological Officer 1	Director of Radiological Monitoring and Communications	23	M	CDR	SMI, MCO
	Radiological Officer 2	Section Leader, Director of Operations	23	M	Graduate student	None
	Shelter Manager B	Section Leader, Director of Training	35	F	Housewife (past shelteree)	None
	Medical Officer	Section Leader, Director of Supply and Maintenance	26	M	Naval Officer	None
	Food Supply Officer	Section Leader	27	M	Lawyer, recent CDR employee	None
	Security Officer	Section Leader, Administrative Clerk	24	F	Housewife (past CDR observer)	None
	----	Director of Activities	23	F	CDR	None
	(shelterees who accepted, then repudiated positions)	Director of Training	27	M	Law student	None
	(outside tape narrative)	Shelter Manager	24	F	CDR	SMI, SMI, MCO
	Shelter Manager A (information card use)	Shelter Manager	26	F	CDR	CDR, SMI
		Section Leader	32	F	Housewife (past shelteree)	None
	Water Supply Officer	Section Leader, Assistant Shelter Manager	32	M	Manager, finance company (past shelteree)	None
	(outside tape narrative)	Section Leader, Director of Radiological Monitoring and Communications	23	M	CDR	None
	Sanitation Officer	Administrative Clerk	19	F	CDR	None

Shadow staff training for ES IX consisted of attendance at regularly scheduled staff research meetings. For those who were not regular CDR personnel, movies of past studies were shown, and the Handbook and previous Final Reports were studied.

ES X shadow staff training consisted of three two-hour briefing sessions. The purpose of the first two briefings was to inform the shadow staff of the purposes of ES X, duties of shelter management, techniques of shadowing the shelter staff, and means by which the pertinent data were to be collected. In addition, each person on the shadow staff was given a list of questions covering the pertinent duties of the shelter staff member whom he was to shadow. Also, at the second session, the members of the shadow staff received instructions on the various data collection forms and their implementation. The third briefing was held at the shelter site to familiarize the shadow staff with the physical aspects of the shelter. Final changes in instructions and scheduling were communicated, and all staff members were encouraged to ask questions about any aspect of the study. An outline of shadow staff training can be found in Table 73.

#### IV. Function of Shadow Staff

Since the function of the shadow staff was to evaluate the performance of the shelteree staff as well as the command structure, it was necessary for them to be in the shelter before the first shelteree entered. Objective data collected included the number of duties completed, the hour of completion, and amount of time required. The shadow staff was free to take notes on the general activity in the shelter if indicated. Data were also collected on structured and unstructured forms filled out during and after the study.

#### V. Conclusions

- A. The shadow staff procedure in large-group studies has proved to be a valuable source of information on in-shelter organization and activity.
- B. As a study progresses, the shadow staff becomes recognized. However, there is no indication that this knowledge by the shelteree staff adversely affects their performance.

Table 73

Shadow Staff Training Schedule  
(ES VII-X)

Topic	Topic Duration			
	ES VII	ES VIII	ES IX <sup>a</sup>	ES X
Shelter Facilities Shelter tour and shelter supplies	1h 15m	20m	-----	2h 00m
Shelter Operations Organization of shelter operations, in-shelter program, shelter living, and shelter organization	1h 30m	1h 10m	1h 45m	40m
Effects of Radiation and the National Shelter Program	55m	35m	15m	20m
Experimental Orientation a) Past studies	1h 15m	35m	8h 00m <sup>b</sup>	-----
b) Experimental variables and pre-shelter processing	15m	10m	1h 15m	50m
Shadow Procedure	15m	15m	15m	30m
Handbook Familiarization	3h 00m	2h 10m	1h 00m	1h 40m
Total	8h 25m	5h 15m	12h 30m	6h 00m

<sup>a</sup> Approximate hours.<sup>b</sup> The eight hours allocated to the study of previous occupancy tests were found to be unnecessary, and consequently were omitted for ES X.



## Chapter 10 - Shelter Handbook for Untrained Management

The purposes of the first four experimental studies (ES I-IV) conducted at the University of Georgia were to evaluate OCD supplies including food rations, sanitation kits, medical kits, and problems relating to kinds of commode chemicals. Minimal living space and limited conditions of ventilation were also investigated, as well as in-shelter activity programs, using trained shelter management.

The construction and implementation of a handbook for untrained shelter management were the primary objectives of ES V-X.

### I. Experimental Study V Handbook

From 8-21 February, 1964, a thirteen-day, thirty-person simulated fallout shelter occupancy test was conducted. Its primary purpose was to evaluate a handbook designed to assist an untrained shelter manager to organize and operate a small community fallout shelter.

The handbook aided the Shelter Manager in many areas such as locating and taking an inventory of supplies. It provided suggestions for taking command, calculating rations, establishing ration distribution routines, setting up toilet facilities and organizing special activities. Because of the small size of the shelter, the Shelter Manager was able to carry out these vital tasks with few assistants.

With the exception of a medic, there was little necessity for other staff positions. The Shelter Manager was asked to appoint an Assistant Shelter Manager, but not until twenty-four hours after shelter entry. The Assistant Shelter Manager was not given specific duties and no reference was made to him after his appointment. A medic was referred to briefly in the handbook, with instructions to inventory the medical kit and to give immediate medical attention when necessary. Although a radiological monitoring kit was available in the shelter, there were no instructions in the handbook concerning radiation detection, other than lectures and the kit itself, nor was the Shelter Manager asked to assign this responsibility.

The Shelter Manager's daily schedule centered around four ration distribution periods. There were two methods of distributing rations-- (1) a fixed-point method, whereby shelterees went to the food and water source, and (2) a moving-point method, whereby food and water were taken to the shelterees. The handbook recommended that the moving point method of distribution be employed due to the very crowded conditions in the shelter and the fixed-point used for water distribution outside of normal meal hours. On the first day of shelter confinement the Shelter Manager was asked to calculate the shelterees' daily rations from a table. The Shelter Manager appointed four

assistantsto help in ration distribution. Their responsibilities were to maintain an inventory of ration stocks, distribute and record food and water given to each person, maintain a vigilance over the provisions and to encourage the shelterees to eat their daily rations.



Vital information was obtained on each shelteree from registration forms completed the first few hours of shelter confinement. In addition to routine information such as name, age, address, etc., they were asked to list talents or hobbies, number of years of schooling, and prior injuries or illnesses. This information, considered confidential and available only to the Shelter Manager and his staff, helped to acquaint the Shelter Manager with the interests and capabilities of each shelteree.

Two shelter schedules were given to the Shelter Manager; one to be used on weekdays and the other on Sunday. The Sunday schedule suggested less vigorous activities and included two worship periods.

The handbook supplied the Shelter Manager with a variety of managerial hints, which were to serve as a daily reminder of things to be done. These hints were in the form of various suggestions pertaining to sanitation, bathing and cleanup procedures, prevention of lethargy and the increase of shelteree morale.

The handbook also contained information relevant to recreation and exercise. A supplement to the handbook aided the Shelter Manager in presenting daily training lectures. Thirteen topics related to radiation were outlined in the handbook and treated more comprehensively in the supplement.

After ES V was completed and data evaluated, it was found that the handbook provided adequate direction for organization and adjustment to shelter conditions. However, CDR staff observations indicated that many modifications were needed, and that further experimental validation was necessary.

## II. Experimental Study VI Handbook

Experimental Study VI, the first of its kind ever conducted in the United States, involved three hundred shelterees in a weekend confinement test. The primary purposes of ES VI were to evaluate shelter staff management of a group this size during a fifty-hour confinement period and to evaluate an in-shelter handbook.

The handbook was written specifically for ES VI to be used by the shelter management staff during the study. The rationale for the handbook came from experimental findings of past CDR studies, scientific reports of other research organizations, and prepared manuals of the various civil defense training schools. The handbook contained information on entry procedures, management and physical facilities, duties of the various staff members, recreational suggestions, training lectures, and a shelter activity schedule.

The shelter management staff was selected prior to ES VI. Many were familiar with civil defense procedures through lectures and discussions with CDR personnel. Some had also taken civil defense courses and others were exposed to survival procedures in the armed services.

Shelter Manager: The primary responsibility of the Shelter Manager was to insure efficient shelter administration. His managerial staff was to assist him in meeting this responsibility. He was to familiarize himself with the duties of each staff member, so that he could function in any staff member's role if necessary. He was also asked to hold periodic staff meetings to discuss problems which may have arisen.

Final decisions on any matter pertinent to shelteree welfare rested with the Shelter Manager, e.g., additional food or water rations, arbitration of disagreements, transfer between sections, defection problems, smoking rules, etc.

Assistant Shelter Manager: The Assistant Shelter Manager assisted other staff members during the first few hours in the shelter. Although he was designated as "second-in-command," in ES VI he was in the shelter for experimental purposes of observation and administration of record forms. He was consulted only in regard to experimental problems, e.g., food record forms, defection forms, etc.

Director of Operations: Upon shelter entry the Director of Operations was to obtain sanitation kits from the Director of Supply and Maintenance and assemble the chemical commodes. He was also to secure the medical kit and set up a medical area. The Director of Operations' responsibilities throughout the shelter stay were (1) food and water distribution, (2) sleeping arrangements, (3) sanitation, (4) health, and (5) security.

The Director of Operations was given an exact amount of food and water ration to be distributed to each person. Therefore, directions for calculating rations were not needed.

Director of Information and Training: The first duty of the Director of Information and Training was to see that the Section Leaders distributed shelteree registration forms and to have the Section Leaders prepare an alphabetical list of the shelterees in their sections. The nursery was to be in operation fifteen minutes before the first scheduled lecture. In addition to the nursery, the Director of Information and Training was responsible for religious activities, training lectures, exercise and recreation.

Director of Supply and Maintenance: During shelter entry the Director of Supply and Maintenance was to prepare supplies for dispensing. This responsibility included assembling cup racks and inventorying all supplies before issuing any item. The first items to be issued were sanitation kits and medical kits to the Director of Operations and registration forms to the Director of Information and Training.

The responsibilities of the Director of Supply and Maintenance were twofold: (1) the inventory, storage, control and distribution of all supplies in the shelter, and (2) the operability of essential shelter equipment. Each Section Leader was to provide one or more persons to assist the Director of Supply and Maintenance.

Section Leader: A shelter staff organization chart outlined all staff positions. Included in the chart were six sections lettered from A to F, each section being allotted a certain number of shelterees. Sections A and B were to include 25 persons, Sections C and D, 50 persons, and Section E and F, 75 persons. Each section has a pre-selected Section Leader. As the shelterees entered the shelter, they were to be met by the Section Leaders who were to form one section at a time marking on each shelteree's palm the section letter. The Section Leader then was to take his section to a pre-designated location in the shelter to begin filling out registration forms.

Soon after entry, each Section Leader was asked to help assemble all shelterees for an introductory talk to be given by the Shelter Manager. Afterwards, the Section Leader was to return with his shelterees to the section location and to brief the section on the following points: (1) smoking regulations, (2) nursery, (3) toilets, (4) food, (5) sleeping, and (6) available medical care.

After the briefing, each Section Leader was to review the registration cards and appoint task group members and sectional representatives. These groups were to assist in dispensing food and water, in the nursery, in training, in religious affairs and in the formation of the security force. Following these appointments, the task groups were to report to the appropriate director.

The major responsibility of the Section Leader was the welfare of his shelterees. He was to cooperate with the other Section Leaders, directors, medical staff and the Shelter Manager, and it was essential that he familiarize himself with the duties of the other staff members.

As previously mentioned, each Section Leader was to appoint food and water dispensers. Their duties were to consist of obtaining supplies from the Director of Supply and Maintenance and distributing them to shelterees in their section. The Section Leader was to keep an accurate record of the amount of rations consumed per day by each person. Two copies of a food and water consumption record were to be made, one to be given to the Assistant Shelter Manager at the end of the day and one to be kept by the Section Leader.

As in the ES V handbook, no reference was made to a Radiological Monitor. Although a radiological monitoring kit was supplied in the shelter, a Radiological Monitor was not pre-selected nor was the Shelter Manager instructed to appoint one. Two medical officers were obtained for the shelter prior to the study.

A shelter schedule was supplied in the handbook for use by all the staff members. It contained the time specific duties of each staff member were to be carried out.

Three lectures were given during the study. The first, "Shelter Life" was given by the Shelter Manager a few hours after entry. The second lecture was given by one of the medical officers who discussed medical problems in the shelter. The final lecture, "Adjustment to Post-Shelter Environment," was presented by the Section Leaders or appointed representatives immediately before the completion of the study. Although the ES VI handbook proved to be adequate for trained management, it was quite obvious it could not have been used by persons not familiar with shelter organizational procedures as it did not provide directions for staff selection in the event that trained management was not available. The selection of a shelter staff, then, was one of the main objectives in revising the future handbook.

### III. Experimental Study VII Handbook

A handbook for an untrained staff that would also be suitable as a guide to trained management was written for, and tested in, ES VII (a 300-person, 7-day study). Although the staff was selected randomly during shelter entry, the handbook provided for the selection of the best qualified shelterees for permanent management.

The handbook was divided into temporary and permanent phases.

The purpose of the temporary phase instructions was to enable untrained persons to perform immediately the tasks needed for protection in a nuclear disaster. Speed and simplicity of operation are

of extreme importance in securing a shelter before arrival of fallout. During the temporary phase it is not important for shelterees to know why something is being done, only that it should be done, and how to do it.

A sign placed on the front door of the shelter read: "First male adult in the shelter: GO TO THE SUPPLY AREA AND PICK UP THE RED BOX. FOLLOW THE INSTRUCTIONS ON THE FRONT OF THE BOX. A MAP OF YOUR SHELTER AND THE NUMBER OF PEOPLE IT WILL HOLD ARE ON THE BACK OF THE BOX." The first male adult to carry out the instructions on the sign became the Temporary Shelter Manager.

Instructions on the front of the handbook directed the Temporary Shelter Manager to pass out job pamphlets to male or female adults next entering the shelter. Inside each pamphlet was a primary instruction: "If you do not wish to do this job, return these instructions to the person from whom you received them." If the shelteree kept the pamphlet, he automatically became a member of the temporary shelter staff.

Staff positions considered necessary for fulfillment of the temporary phase purpose and their respective duties are listed below:

Temporary Shelter Manager

1. Hands out numbered temporary job instruction envelopes.
2. Sets up temporary command post.
3. Directs people into the shelter.
4. Meets with the Director of Security and Assistant Shelter Manager to see that all shelter functions are being carried out.
5. Helps select permanent staff.

Temporary Assistant Shelter Manager

Assists Shelter Manager by supervising the following people:

1. Medical Team.
2. Director of Supply.
  - a. Water Supply Guard.
  - b. Equipment Supply Guard.
3. Director of Operations.

Temporary Medical Man

1. Sets up medical area.
2. Treats patients.

#### Temporary Director of Supply

1. Supervises the supply guards.
2. Takes inventory of supplies.
3. Sees that supplies are issued only to authorized persons.
4. Searches shelter for any additional supplies.

#### Temporary Water Supply Guard

1. Guards the water.
2. Gives water to only those persons who have authorization cards.

#### Temporary Equipment Supply Guard

1. Guards food, medical kits, radiological kit, and sanitation kits.
2. Gives supplies only to those persons who have authorization cards.

#### Temporary Director of Operations

1. Sets up male and female commode areas and supervises the Commode Monitors.
2. Supervises the Radiological Monitor and the Communications Man.

#### Temporary Door Guards

1. Guards all entrances to the shelter, one guard per entrance.
2. Gives traffic directors their instruction sheets.
3. Counts people coming into the shelter and gives this count to the Census Taker.

#### Temporary Window and Door Closer

Closes all doors (not used as shelter entrances) and windows leading to the outside to prevent contamination of the inside of the building.

#### Temporary Traffic Directors

1. Gives Section Leaders their instruction sheets.
2. Asks people coming into the shelter whether there are any doctors or nurses or trained civil defense shelter staff members among them.
3. Assists Section Leaders in keeping order among people.

#### Temporary Fire Control Team

1. Looks for fire fighting and rescue equipment.
2. Fights fires in and near the shelter.
3. Turns off electrical equipment until after the danger of blast is past.

#### Temporary Commode Monitors (male and female)

1. Supervises use of commodes.
2. Stresses need to conserve toilet tissue.

#### Temporary Radiological Monitor

1. Makes operational check on CDV-715 survey meter.
2. Stays outside shelter until a reading of 0.5 r/hr. is reached.
3. Reports the presence of fallout to the Shelter Manager.
4. Maintains a record of in-shelter radiation levels.

#### Temporary Communications Man

1. Looks for telephones in the shelter.
2. Receives incoming messages and relays them to the Shelter Manager.
3. Keeps a written record of all messages sent and received.

Five members of the temporary staff (Temporary Shelter Manager, Director of Security, Assistant Shelter Manager, Census Taker, and the Window and Door Closer), using data obtained from the Shelteree Information sheets, were to be designated to select a permanent staff. Information forms included the shelterees' name, age, years of schooling, occupation, and skills. These qualifications were then to be matched, when possible, with the suggested criteria of experience for each job in the permanent phase. Qualified shelterees were then to be asked to accept jobs. If willing, they were to receive instruction leaflets from the Temporary Shelter Manager concerning duties of the permanent shelter staff.

Each permanent staff position was to be selected in order of importance. The selection sequence of the staff members, and their duties follow. (Note the changes and additions of staff members from past handbooks.)

Shelter Manager: The two most important duties of the Shelter Manager were to keep the shelter operating efficiently and to protect the shelterees from bomb blasts and fallout. He was to carry out these tasks by delegating responsibilities to other staff members by continual supervision of them. However, final responsibility for decisions was to be his own. A daily shelter schedule was to be established by the Shelter Manager, to include times for staff meetings, food and water distribution, training sessions, rest periods, etc.



Attached to his job leaflet was a suggested shelter schedule outline to be used if he chose not to devise one. Also attached to his leaflet was a page listing various strategic areas and equipment in the shelter such as fire extinguishers, fuse box, plumbing fixtures, supplies, high radiation areas, etc. His instructions were to draw a rough copy of the floor plan of the shelter and include all the items listed.

Assistant Shelter Manager: The Assistant Shelter Manager was to act as an advisor to the Shelter Manager, but to remain under his direction. If necessary, he was to relieve the Shelter Manager and take complete control of the shelter for short periods. One of his main functions was to act as chairman of the Advisory Council. This council was to be made up of Section Leaders, who would represent the people to the management staff, and an Administrative Clerk, who would keep a written account of all meetings.

Administrative Clerk: The Administrative Clerk has various secretarial duties to perform in addition to recording the nature of Advisory Council meetings. Under the direction of the Shelter Manager, he is to keep a chronological log of all events that occur in the shelter. A sheet entitled "Shelter Log" is provided in the leaflet for use in recording all shelter events. Other responsibilities are to collect and file shelteree forms, record individual radiation dose readings received by those persons in the shelter whose duties require them to go outside the shelter, and finally, to keep a daily record of the in-shelter levels of radiation. For this purpose, radiation dose record forms are provided.

Director of Operations: Although the responsibilities of the Director of Operations were essentially the same as in the ES VI handbook, the directions for food and water calculation and distribution changed considerably. The task of calculating food and water rations for a two-week period was given to him in an outlined form which indicated the amount of rations each person received each day.

There were several methods of distributing rations provided. One method, recommended by the handbook as the easiest to employ, was sectional feeding. This method consisted of Section Leaders obtaining daily rations from the Director of Operations at the start of each day, then distributing them to the shelterees at each meal. Another method, shelter-wide feeding, (utilized in ES V) was recommended for small shelters. There were two types of shelter-wide feeding that could be utilized: (1) fixed-point feeding, whereby sections filed by the Director of Operations to receive their rations, and (2) moving-point feeding, whereby the Director of Operations brought the rations to the shelterees.



The Director of Operations is instructed to select a Head of the Shelter Medical Staff, preferably a physician. However, if no physician is available, the Director of Operations is to select a person with a background in osteopathy, veterinary medicine, nursing, etc. The shelter medic is then to receive a leaflet entitled, "Head of the Shelter Medical Staff," to assist in performance of duties.

Director of Supply and Maintenance: The duties for the Director of Supply and Maintenance were expanded to include security watches. The safety watch, supply watch, commode watch, and detention watch were under the Director of Supply and Maintenance's supervision. (The radef watch however, was under the Director of Radiological Monitoring and Communication's supervision.) Each Section Leader was to appoint a designated number of shelterees from his section to fill these jobs. It was the responsibility of the Director of Supply and Maintenance to supervise the watch members and to see that they reported to their assigned watches on time.

Attached to the Director of Supply and Maintenance's leaflet were instructions for the Head of the Fire Control Team.

Director of Radiological Monitoring and Communications: This very important job was not an experimental variable in past studies. The Director of Radiological Monitoring and Communications was to utilize the booklet stocked in the Radiation Detection Kit entitled "Handbook for Radiological Monitors." Additional duties not covered in the stocked booklet were added to the handbook, e.g., setting up a twenty-four hour radef watch schedule, selecting and supervising radiological monitor teams, and keeping accurate records of in-shelter dose rates. He was instructed to take readings every fifteen minutes when radiation levels were rising and every hour when they were falling. A Radiological Monitor's Log was supplied in the handbook for recording such information. Instructions were also given on shelter emergence, to take place when radiation levels were low enough to be safe and after authorization from proper authorities, such as the Emergency Operating Center. Other responsibilities of the Director of Radiological

Monitoring and Communications were to determine the nature of shelter communications equipment, and to establish a twenty-four hour communications watch. All messages sent and received were to be accurately recorded on the Communications Monitor's Log attached to the Director of Radiological Monitoring and Communication's leaflet.

Director of Activities: This position was added to relieve the Director of Training of all duties except that of the in-shelter training program. The Director of Activities was responsible for setting up a nursery, organizing and conducting exercise and recreational periods, and implementing religious services.

Director of Training: Responsibilities included (1) training the shelter population on the nature of radioactive fallout, (2) providing lectures on the practical problems of shelter living, and (3) training for post-attack emergence. The Guide to Shelter Living and Training, a supplement to the handbook, contained training material. Lecture material on ten topics on areas such as nuclear explosions, fallout, radiation detection, and decontamination were provided. The Director of Training was to select and train assistants to present lectures and lead discussion groups. Steps for training these assistants were given to him in outline form in the handbook.

Section Leader: The responsibilities of the Section Leader were essentially the same as in the previous handbook edition. In addition, the Section Leader was required to attend the Advisory Council meetings for the purpose of presenting sectional complaints or suggestions.

The permanent staff was instructed in the handbook supplement to choose its own replacement, the alternate staff. Data on the Shelteree Information sheets were used in these selections. Each alternate staff member was to act as assistant to his counterpart on the permanent staff for at least one day, prior to assuming responsibilities. The alternate staff would then be given instruction leaflets from the handbook to study, and was to assume shelter supervision gradually.

The handbook supplement, Guide to Shelter Living and Training, was to be utilized by all staff members. Its purpose was to provide the shelter staff with additional information not given in the handbook. This information, although not vital, was designed to help improve shelter life. The guide was divided into sections pertinent to the appropriate responsibilities of shelter management. It was constructed so that each section could be removed and given to the person responsible for different aspects of shelter organization.

Findings in ES VII indicated that the staff organization was sufficient for a three-hundred person shelter configuration. However, it was felt that various methods of temporary phase shelter organization should be re-evaluated to improve further this aspect of shelter planning.

#### IV. Experimental Study VIII Handbook

The prime objective for revision of the handbook in ES VIII (300-person, weekend study) was to incorporate a three-person emergent shelter manager triumvirate, with identical duties in the temporary phase. The rationale for the triumvirate management system was a three-fold insurance for the accomplishment of temporary phase operations.

A sign attached to the shelter entrance door directed the first three adults entering the shelter to the handbook. Initial instructions directed them to work together as one to see that all tasks in the temporary phase were completed efficiently. They were then to proceed to the main shelter entrance and to distribute job instruction envelopes in an ordered sequence. Volunteers who could read and who were willing to take jobs were to be recruited. After all numbered envelopes had been given out, the three Temporary Shelter Managers were to select the permanent staff, with the help of the Temporary Assistant Shelter Manager, the Temporary Director of Operations, and the Temporary Director of Supply.

Minor changes were made in all temporary staff positions for clarity and brevity, in view of the consideration that persons under great stress would be able to absorb only basic instructions. Also certain directions basic to survival were capitalized, underlined or preceded by the phrase, "important for survival." Specifications of the sex of the person to receive each job instruction leaflet were eliminated. Rather the Temporary Shelter Managers were told to pass out the leaflets to persons who could read. Major changes in the instructions for the Temporary Radiological Monitor were made for clarity of communication in assembling, checking, and using the equipment without having to read the stocked radiation detection booklet immediately.

Revisions were also made in the format of the permanent phase instructions. Duties were divided into three sections: (1) Do Immediately, (2) Do Daily, and (3) General Instructions.

The task of calculating rations was made easier in the ES VIII handbook with, for the first time, the provision of ration charts. The Director of Operations was instructed to obtain information on the number of people in the shelter and the number and kinds of stocked food supplies available. By then referring to ration tables, he could calculate the amount of rations each person was to receive daily.

Other changes in the Director of Operations' instructions consisted of more stress on food sanitation and deletion of the moving-point, shelter-wide method of feeding.

Included in the Section Leader's set of instructions was a shelter meal check-off list to ensure equitable distribution of food. The handbook also provided for food and water security within the sections, and daily sectional cleanup periods to ensure better sanitation.

Minor additions were made to the Administrative Clerk's records, to include a structured Section Radiation Dose Record and an Individual Radiation Dose Record. To the Radiological Monitor's records a Communications Monitor's Log, both incoming and outgoing, were added.

All of the changes and revisions, particularly the implementation of a three-man shelter managerial staff, proved beneficial to the staff organization of ES VIII.

#### V. Experimental Study IX Handbook

The primary purposes of ES IX (a 160-person, weekend test) were to investigate the effects of reduced space allotment on shelter management and the plans for efficient space utilization. Handbook revision was not a major experimental variable, and no changes were made to the permanent staff organization. However, changes in temporary staff organization were introduced and evaluated.

The first three leaflets in the box were for Temporary Shelter Manager 1, 2, and 3 respectively. Temporary Shelter Manager 1 had the first task of handing out leaflet instructions for the other eight temporary staff members. His remaining duties were to be fulfilled afterwards; consequently, in the list to follow, he is again mentioned at the end of the leaflet sequence:

1. Shelter Manager 1
2. Shelter Manager 2
3. Shelter Manager 3
4. Radiological Officer 1
5. Radiological Officer 2
6. Security Officer
7. Water Supply Officer
8. Food Supply Officer
9. Medical Officer
10. Communications Officer
11. Sanitation Officer
12. Shelter Manager 1

Following are brief explanations for the leaflet sequence.

Shelter Managers: Shelter Managers 2 and 3 received their full set of instructions prior to any of the staff officers; thus it was hoped to establish an overall authority symbol and immediate control. Shelter Manager 1 was to hand out other leaflets. His other tasks are noted later in this report.

Radiological Officers: If this area did not function, all other tasks might be accomplished to no avail. Hence, there were now to be two such personnel, and their instruction cards were to be the first of the staff cards passed out.

Security Officer: Next to radiological monitoring, building security has priority primarily for preventing an influx of fallout in those areas of the building surrounding the shelter.

Water Supply Officer: Once the all-important radiation protective measures are initiated, attention is turned to the next major task, that of securing supplies for survival. Water is naturally given preference over food.

Food Supply Officer: The function of this position was similar to that of the Water Supply Officer.

Medical Officer: This person's function was to care for shelterees after they had arrived.

Communications Officer: This position, though important, may not function in many shelters, since few Emergency Operating Centers have communications networks in their shelters, and since phones may not be in shelter areas. However, if equipment is available, this staff member is instructed to supervise its use.

Sanitation Officer: This position is important to the establishment of sanitation measures, e.g., setting up an initial commode, which is vital to preventative public hygiene, as well as to meeting immediate physiological needs.

Shelter Manager 1, after having distributed other staff members' instructions, was now to fulfill his remaining responsibilities.

The temporary staff structure of ES IX is presented in Figure 16. A list of the duties of the respective staff members follows:

Temporary Shelter Manager 1

1. Hands out eight job instruction leaflets.
2. Checks to see that Temporary Shelter Managers 2 and 3 are doing their jobs.
3. Helps Temporary Shelter Manager 2 select the permanent staff.
4. Has instructions concerning arrival of any trained staff members.
5. Authorizes messages to be sent by Temporary Communications Officer.
6. Has instructions for closing shelter doors if capacity is reached.

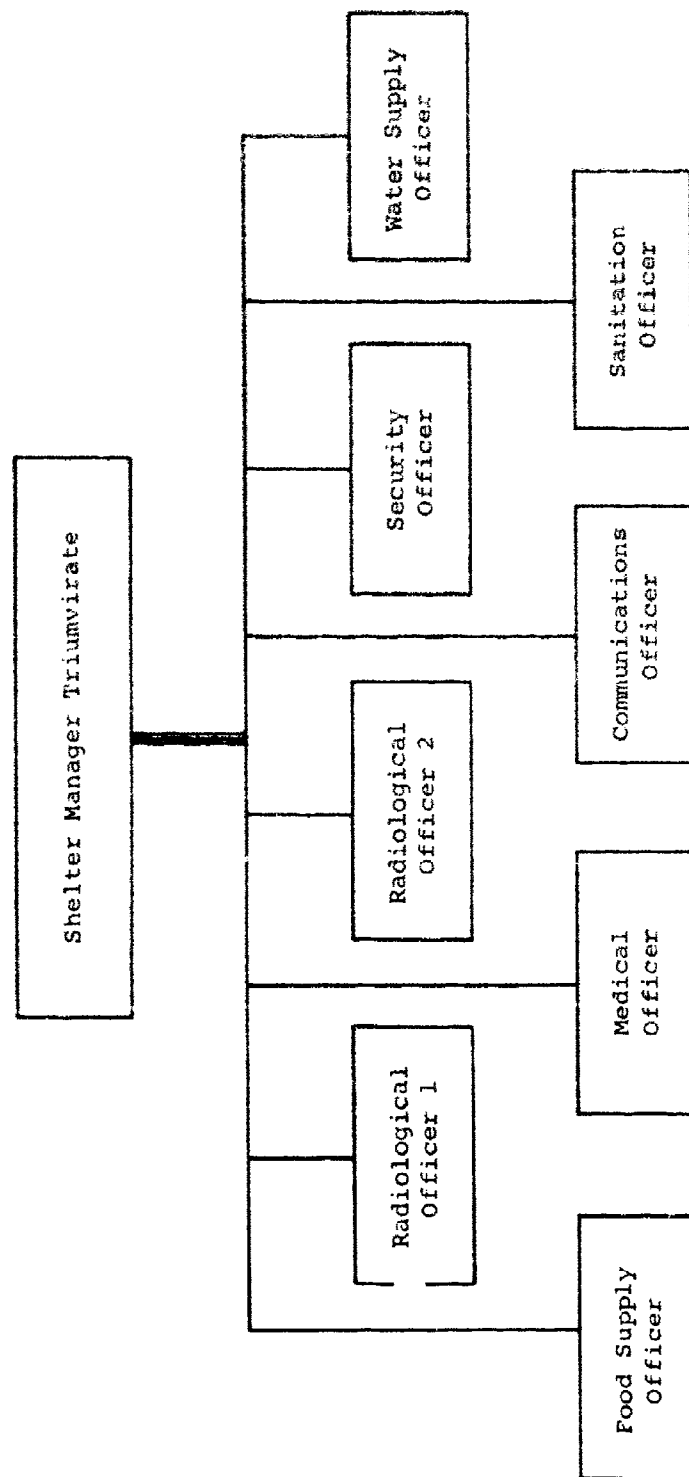


Figure 16. Temporary shelter management staff (ES IX).

#### Temporary Shelter Manager 2

1. Passes out Information Cards with aid of assistants (but does not recruit shelterees functioning as temporary staff members).
2. Directs people to move away from doors, and to be seated and quiet.
3. Gives introductory orientation to people while they are filling in Information Cards.
4. Collects and sorts Information Cards, with help of assistants.
5. Helps Temporary Shelter Manager 1 select permanent staff.

#### Temporary Shelter Manager 3

1. Collects signed pin-on cards from the eight temporary staff officers.
2. Checks on the eight temporary staff officers to see that they are doing their duties.
3. Has emergency space utilization plans for implementation as soon as possible.

#### Radiological Officer 1

1. Uses CDV-715 survey meter to monitor outside for arrival of fallout.
2. Sets up CDV-742 dosimeters in shelter area.

#### Radiological Officer 2

Uses CDV-700 survey meter to check the following items for radioactive dust during shelter entry: (1) people, (2) food, and (3) other items brought in.

#### Security Officer

1. Closes all doors and windows in areas immediately surrounding the shelter.
2. Searches for such items as fire extinguishers, rescue equipment, flashlights, and batteries.
3. Checks operational status of building utilities (water, lights, heating, ventilation).

#### Water Supply Officer

1. Determines location of OCD water drums and fills them if necessary.
2. Moves remote water drums to the shelter and guards them.

#### Food Supply Officer

1. Determines location of OCD food supplies, medical kits, sanitation kits, and portable ventilation kits.
2. Moves these items into the shelter and guards them.



#### Medical Officer

1. Selects place for medical area and posts sign.
2. Gets medical kit, and renders first aid.
3. Records all uses of medical supplies.

#### Communications Officer

1. Uses available portable radios for obtaining civil defense news bulletins.
2. Determines location of any telephones in the shelter area.
3. Records all incoming and outgoing messages over both phone and radio.
4. Insures that messages are transmitted by himself only or a Temporary Shelter Manager.

#### Sanitation Officer

1. Seals off flush commodes.
2. Assembles one chemical commode.
3. Monitors use of chemical commode.

A sign, posted at the entrance door, directed the shelterees to the handbook. The first three adults who read the instructions on the front of the handbook and began implementing them were the Temporary Shelter Managers.

All of the instructions, including eight other temporary staff positions, were on yellow cards which were large enough to list all duties. This procedure facilitated reading and lessened the chances of losing or damaging the instructions.

Three hundred Information Cards were placed inside Temporary Shelter Manager 2's instruction envelope. These cards were to be distributed by an assistant, (1:100 assistant:shelteree ratio) who was instructed to give one card to each adult entering the shelter, telling him to fill the card out immediately.

The Information Cards were designed for the purpose of obtaining trained and experienced persons needed for the permanent shelter staff positions. In addition to name, age, years of schooling and present occupation, the cards also contained nine professional categories beginning with civil defense, then management, medical, scientific, teaching, policeman, fireman, military, and "other" (meaning a profession not categorized).

While Information Cards were being filled out, Temporary Shelter Manager 2 gave an introductory orientation speech to all shelterees. He stressed the importance of filling out the Information Cards; he told them of the availability of supplies, and acquainted them with the functions of the managerial staff. The necessity of staying in the shelter was also pointed out.

Immediately after the speech, Temporary Shelter Manager 1 with Temporary Shelter Manager 2 and their assistants began collecting cards and sorting them into stacks by the area or category marked "1." From these stacks the permanent staff was hopefully to be selected. If no one marked "1" by one of the suggested categories of experience, the two Shelter Managers were instructed to select someone who marked "2" by these categories. If this procedure failed, the Temporary Shelter Managers were instructed to choose the person available with the highest education. The permanent staff positions and the desirable qualifications for each position were provided in the instructions. The Shelter Managers were instructed to select the permanent staff in the order in which the positions were listed. Permanent staff titles and duties were not revised for ES IX. However, the sequence in which they were selected was changed considerably since the most important jobs for organizing a shelter should be selected first. On the basis of past studies, the following order for selection was used:

1. Shelter Manager
2. Director of Radiological Monitoring and Communications
3. Director of Operations
4. Director of Supply and Maintenance
5. Director of Training
6. Assistant Shelter Manager
7. Head of Shelter Medical Team
8. Director of Activities
9. Section Leaders
10. Administrative Clerk

When the two Shelter Managers had finished selecting the permanent staff, Temporary Shelter Manager 2 was to see that all the permanent staff members had received their instruction leaflets and were beginning to carry out their instructions.

The first duty of Temporary Shelter Manager 3 was to establish an area to be used by management as a command post. Enclosed in the instructions was a sign to be posted for designating this area.

After all eight temporary staff members had turned in their identification cards, Temporary Shelter Manager 3 immediately began supervising these people to make sure they were doing their jobs. If, for some reason, a temporary staff member refused to carry out his instructions, Temporary Shelter Manager 3 was responsible for finding another shelteree to replace him. A list of the temporary staff and their duties, including the Shelter Managers, was provided for Temporary Shelter Manager 3 in his instructions. This list enabled him to supervise the staff more adequately and efficiently.

The final instruction given to Temporary Shelter Manager 3 was to utilize all available shelter space for the comfort and safety of the shelterees. Several ideas were listed for him, such as moving

all unused bulky items outside the shelter and making rest room areas, if not available, by stacking water drums and food boxes. Another suggestion for space utilization was the spreading of food boxes across the floor in one layer and having the shelterees live on top of the boxes.

The temporary staff structure proved quite adequate in ES IX. Most of the temporary duties, including the selection of a permanent staff, were completed within several hours.

#### VI. Experimental Study X Handbook

In accordance with the effort to improve continually on the shelter handbook, several changes were made prior to ES X.

After the first three entering shelterees had found the handbook, one of them was to read a short speech (provided on the front of the handbook) to all the shelterees, asking for nine adult males with at least a high school education to volunteer for jobs. The reversion to the request for males was decided upon after observing the difficulties that female shelterees encountered in performing tasks requiring masculine strength. However, the procedure was not followed in ES X, and temporary staff members were arbitrarily appointed rather than recruited on a voluntary basis.

In the previous study the Temporary Shelter Managers were designated as Temporary Shelter Manager 1, Temporary Shelter Manager 2, and Temporary Shelter Manager 3. Because this numbered sequence might mistakenly imply rank or precedence, the numbers were changed to the letters A, B, and C. Also, instruction cards for each Temporary Shelter Manager were of different colors, whereas the rest of the temporary staff cards retained the yellow color used in ES IX. The purpose of the differential color coding was to facilitate recognition of key staff members.

A shelter Information Sheet provided on the back of handbooks used in ES IX and X gave the location, capacity and protection factor of the shelter. It also provided space for listing OCD stocked supplies and information on the local Civil Defense Director and the trained Shelter Manager of that particular shelter. ES X changes in this information emphasized the shelter capacity by the use of color coding, and listed types of OCD supplies. Although in ES IX Temporary Shelter Manager A was told to keep the handbook with him as vital information, this instruction was ignored. In ES X this instruction was stressed by a brief summary of the shelter Information Sheet and by referring the staff needing this information to Temporary Shelter Manager A.

The Information Cards and the selection procedure were revised to make the task of choosing the permanent staff easier and faster for Temporary Shelter Managers A and B. The categories "policeman," "fireman," and "other" were deleted, as well as the designation number "3," used by the shelterees to signify their familiarity with a specific area. Rather than giving Information Cards to all persons, as in the ES IX procedure, Temporary Shelter Manager B was to give cards only to shelterees seventeen years of age or older. In selecting the permanent staff, Temporary Shelter Manager A and Temporary Shelter Manager B were supplied with a biographical table giving titles, qualifications, selection stacks, and duties of the staff. This table presented a single overview of staff positions.

After the Information Cards had been collected and properly grouped, Temporary Shelter Manager A and Temporary Shelter Manager B were to select the four most qualified persons from the combined management and military stacks to fill the positions of Shelter Manager, Assistant Shelter Manager, Director of Operations and Director of Supply and Maintenance. These four qualified shelterees would then decide among themselves which position each preferred. Meanwhile, Temporary Shelter Manager A and Temporary Shelter Manager B were to select the two most qualified shelterees from the scientific stack as the Director of Radiological Monitoring and Communications and the Director of Training, the better qualified individual to fill the former position. Next to be selected was the Head of the Shelter Medical Team, appointed from the medical stack. The teaching stack was utilized in choosing the Director of Activities and the Administrative Clerk. The better qualified of these two was to be selected as the Director of Activities. Returning to the management and military stacks, the Shelter Managers then selected one Section Leader for each twenty-five to thirty persons in the shelter or possibly one Section Leader for each room in the shelter, whichever was indicated. The instructions for distributing the permanent job leaflets were not revised from previous studies.

A more detailed outline of all the temporary staff duties was provided for Temporary Shelter Manager C, enabling him to function more adequately as a supervisor. A task added to his instructions was the announcement of locations of the established medical area and commode area. Another instruction concerned the problem of when to close the shelter doors. Temporary Shelter Manager C was advised to make sure the shelterees were equitably distributed over the shelter area. If, when everyone was seated, they appeared to approximate the seating arrangement of the average theatre, Temporary Shelter Manager C was to inform the other Managers and all three would decide at that time whether or not to close the shelter doors.

Two Packaged Ventilation Kits were added to the OCD supplies stocked in the shelter for ES X, necessitating the addition of another temporary staff position, that of Temporary Ventilation

Officer. Contained in his leaflet were instructions for constructing and operating the Packaged Ventilation Kits. In the permanent phase, continued operation of the Packaged Ventilation Kits was under the supervision of the Director of Supply and Maintenance.

For the permanent phase, the Shelter Manager and Assistant Shelter Manager were given a detailed list of all permanent staff positions and responsibilities. This enabled them to supervise their staff more efficiently and to give them an overall picture of what the permanent staff was to accomplish.

The Shelter Manager was provided with a Shelter Staff Organization chart allowing space for the names of the shelterees who filled staff positions. Also included in the Shelter Manager's instructions was a duplicate copy of any emergency space utilization plans used by Temporary Shelter Manager C in the temporary phase. Signs, symptoms and treatment of radiation sickness were also incorporated into the Shelter Manager's leaflet. Previously, radiation illness was used as a training topic by the Director of Training; however, since this could cause needless worry and anxiety among the shelterees, the lecture was deleted. The information, however, was given to the Shelter Manager.

The first task of the Assistant Shelter Manager was to form and supervise sections and to assign respective Section Leaders. Then he was to see that Information Cards on everyone, including children, had been filled out. Each Section Leader was responsible to him for this task. All other instructions of the Assistant Shelter Manager remained the same.



The Director of Operations' instructions were not changed. However, the format was revised for easier reading, e.g., "boxed" instructions.

One of the first instructions for the Director of Supply and Maintenance was to obtain names of temporary staff members and to ask each the respective locations of supplies. The Supply Inventory sheet was revised to include all of the names of OCD supplies.

The instructions for setting up the chemical commodes were also changed. Rather than using the cardboard drums as commodes, which in past studies involved leakage problems, use of the metal water drums was recommended. Therefore, the Temporary Sanitation Officer and the Director of Supply and Maintenance were to empty the contents of a water drum into a plastic-lined cardboard drum and to use the metal drum as a commode.

The Administrative Clerk's instructions were not revised. However, she was given additional aids in recording various items. A list of all the forms used in the temporary and permanent phase were supplied, along with the Shelter Staff Organization chart, Shelter Map, Shelter Schedule, and Supply Inventory sheet.

The instructions for the Director of Radiological Monitoring and Communications, Director of Training, and Director of Activities remained the same as in the previous study.

The use of cup racks in dispensing the water was stressed more in the Section Leader's instructions, for purposes of better sanitation and supply duration.

Other changes in the permanent phase of the handbook were:

1. Stressing completion of the shelter map form.
2. Stressing the need to control children, in order to dampen noise level.
3. Keeping commode watches brief so as to ensure equitable watch assignment.
4. Stressing need for proper sanitation (in Director of Supply and Maintenance's instructions).
5. Defining more precisely the nature of material to be entered in the Shelter Log.
6. Adding a Section Leader's Water Check-off List.

Tables 74 and 75 give a summary of all major handbook changes.

## VII. Conclusions

- A. Using the research prototype CDR Handbook, 300-person shelter populations with emergent untrained leadership functioned adequately.
- B. The research prototype CDR Handbook, although designed for shelters without trained management, could also be used as a guide for trained shelter management.
- C. The use of a triumvirate shelter manager system has been found to facilitate implementation of the temporary phase.

Table 74

Major Revisions of Handbook Temporary Phase Format  
(ES VII-X)

Revision	ES VII	ES VIII	ES IX	ES X
Utilization of a temporary phase				
Selection of a temporary staff				
Incorporation of:				
Temporary Shelter Manager	X	X	X	X
Triumvirate Shelter Manager system	X	X	X	X
Triumvirate Shelter Manager system with separate duties				
Designation of three Temporary Shelter Managers as 1, 2, and 3				
Designation of three Temporary Shelter Managers as A, B, and C				
Incorporation of:				
Temporary Assistant Shelter Manager	X			X
Temporary Medical Man	X	X		X
Temporary Director of Supply	X	X	X (Temporary Medical Officer)	X
Temporary Water Supply Guard	X	X	X (Temporary Food Supply Officer)	X
Temporary Equipment Supply Guard	X	X	X (Temporary Water Supply Officer)	X
Temporary Director of Operations	X	X		
Temporary Door Guards	X	X		
Temporary Window and Door Closer	X	X		
Temporary Traffic Directors	X	X		
Temporary Fire Control Team	X	X		
Temporary Commode Monitors	X	X		
Temporary Radiological Monitor			X (Temporary Sanitation Officer)	X
Temporary Radiological Officer 1	X	X	X	X
Temporary Radiological Officer 2	X	X	X	X
Temporary Communications Man			X (Temporary Communications Officer)	X
Temporary Director of Security	X	X	X (Temporary Security Officer)	X

(Contd.)

Table 74 (Contd.)

Revision	ES VII	ES VIII	ES IX	ES X
Temporary Section Leader				
Temporary Ventilation Officer	X	X		X
Utilization of Information Cards or sheets to select the permanent staff	X	X	X	X
Inclusion of professional categories on the Information Cards			X	X
Improvements in distributing, collecting and sorting Information Cards by distributing to persons over 17 years of age and reducing number of categories				X
Utilization of instruction cards rather than sheets				X
Utilization of different colored instruction cards for each			X	
Temporary Shelter Manager				X
Instructions incorporated for dispensing rations if temporary phase is prolonged				X
Inclusion of emergency space				X
Utilization plans			X	
Suggestions added to Temporary Managers' instructions on when to close shelter doors				X
Utilization of metal water drums for commodes				X
Incorporation of a preliminary speech read by one of the Shelter Managers asking for volunteers to fill temporary staff positions				X
Omission of section formations until permanent phase			X	X

\*The "X" refers to an addition or revision. Absence of "X" indicates absence of, or the dropping of, an item.



Table 75  
Major Revisions of the Handbook  
Permanent Phase Format  
(ES VI-ES X)

Revision	ES VI	ES VII	ES VIII	ES IX	ES X
Director of Operations	X*	X	X	X	X
Director of Information and Training	X				
Director of Supply and Maintenance	X	X	X	X	X
Section Leader	X	X	X	X	X
Administrative Clerk		X	X	X	X
Director of Radiological Monitoring and Communications		X	X	X	X
Director of Training (omitting "Information" from title)		X	X	X	X
Director of Activities		X	X	X	X
Head of Fire Control Team		X	X	X	X
Head of Shelter Medical Team		X	X	X	X
Calculation of rations for a two-week period		X	X	X	X
Utilization of ration charts			X	X	X
Incorporation of ES V <u>Handbook</u> as Section Leader instructions	X	X	X	X	X
Selection of an alternate staff		X	X	X	X
Inclusion of emergency space utilization plans				X	X
Utilization of metal water drums for commodes					X
Director of Operations' and Director of Supply and Maintenance's instructions rewritten					X
Director of Radiological Monitoring and Communications' instructions revised			X		X

\*The "X" refers to an addition or revision. Absence of "X" indicates absence of, or the dropping of, an item.

- D. The use of volunteers, rather than selection by random appointment, is essential to the formation of an efficient temporary staff.
- E. Any conclusions on the adequacy of the CDR Handbook for 500-person shelter populations must await experimental replication on groups of similar or larger size.

## Chapter 11 - Medical Aspects of Shelter Confinement

### I. Medical Coverage

As part of recruitment procedures, Civil Defense Research has required medical information on all selected shelterees (see Table 76). In the 30-person studies (ES I-V), all individuals selected were required to submit a signed statement from a physician, indicating that he considered them capable of undergoing the confinement experience. As part of pre-shelter processing for these studies, the current health of shelterees was established by medical interrogation and brief examination by physicians. This medical coverage was found successful in precluding anyone with medical problems that could be complicated by the austerity of confinement.

When CDR embarked on a series of larger investigations, medical statements from physicians were not required, but instead an extensive self-report of medical history was submitted. Persons selected for these studies (ES VI-X) were questioned during pre-shelter processing concerning their current health, and subjects reporting questionable conditions were referred to physicians to evaluate the complaint in light of the demands of the experiment. In all studies, shelterees over fifty years of age were given routine medical examinations prior to confinement, and in ES VII children under ten years of age were also given such an examination.



The earlier 30-person experimental studies were not faced with the problem of locating a "sick bay" or medical area per se. In the larger studies, however, providing needed privacy, isolating the sick from the general shelter population, and supplying environmental requisites such as adequate temperature and ventilation became problematic. In ES VI, a medical area was established by erecting walls fabricated with sheets of corrugated fiberboard.

ES VII and VIII were conducted in a two-floor, four-room experimental shelter facility. A physician-nurse team was on duty at all times. The ES VII medical area was unfortunately first

Table 76

Medical Coverage for CDR Occupancy Studies  
(ES I-X)

Experimental Studies	Pre-Shelter		In-Shelter		Post-Shelter	
	Self- Report	Physician's Statement	Medical Examination	Medical Kit	Medical Personnel	Medical Bag
ES I	No	Yes	All shelterees	A	1 Senior medical student	Yes
ES II	No	Yes	All shelterees	A	1 Senior medical student	Yes
ES III	No	Yes	All shelterees	A <sup>a</sup>	1 R.N. <sup>b</sup> 1 L.P.N.	No
ES IV	No	Yes	All shelterees	A <sup>a</sup>	1 R.N. <sup>b</sup>	No
ES V	No	Yes	All shelterees	A	2 R.N.s 1 L.P.N.	No
ES VI	Yes	No	Referral cases only	C	2 M.D.s 2 R.N.s	Yes
ES VII	Yes	No	For shelterees 50 years and older, 10 years and younger, and referral cases	C	3 M.D.s (rotating 2 R.N.s) shifts	Yes
ES VIII	Yes	No	For shelterees 50 years and older and refer- ral cases	C	2 M.D.s (rotating 3 R.N.s) shifts	Yes
ES IX	Yes	No	For shelterees 50 years and older and refer- ral cases	C (with supple- mentary items)	2 M.D.s (rotating 3 R.N.s) shifts	In emer- gency area outside shelter
ES X	Yes	No	For shelterees 50 years and older and refer- ral cases	C (with supple- mentary items)	2 M.D.s (rotating 6 R.N.s) shifts	In emer- gency area outside shelter

<sup>a</sup>Only selected items from Medical Kit A were stocked in ES III and IV.<sup>b</sup>Local physicians were on call.

located adjacent to the first-floor toilet facilities, where the flow of traffic between the two floors was greatest. A better location was later found in one of the small rooms on the first floor. In ES VIII, the medical area was established on the second floor of the shelter facility, at the stairway entrance connecting the two floors. This location was inappropriate due to lack of privacy, lack of space for rest and quiet, and the draught created by the flow of air through the stairwell. An attempt was made by medical personnel to rectify this situation; however, a request from the Shelter Manager that shelterees move from one of the small rooms on the first floor in order that the medical area be relocated was ignored, and management did not assume further responsibility in this regard.

A similar situation existed in ES IX, the 160-person, one-room study. Physicians established the medical area in a corner of the room with little differentiation from the rest of the shelter area. In ES X the medical area was located in a small downstairs room.

On the basis of the findings from these confinement studies, it was concluded that the appropriate location of a shelter medical area requires immediate attention and should have the full support of shelter management.

## II. Medical Complaints

The nature of the medical complaints registered during four 30-person, one 160-person, three 300-person and one 500-person experimental studies are indicated on Table 77. These figures are based on medical complaint and treatment records maintained by in-shelter physicians; however, since medical personnel were not the same in all studies, medical records reflect differences in the recording of complaints. Generally, three categories of complaints predominate in all studies--headaches, colds or sore throats, and stomachaches or nausea.



Table 77

Medical Complaints of CDR Occupancy Studies  
(ES II-X)

Complaint	10-Person Study			150-Person Study			300-Person Study			500-Person Study			Total Complaints
	ES II	ES III	ES IV	ES V <sup>a</sup>	ES IX	Study	ES VI	ES VII	ES VIII	ES X	Study	Study	
Headache	22	65	10	31	58		157	208	54	94			699
Cold, sore throat	8	26	1	11	6		4	97	5	19			177
Stomachache, nausea	7	23	7	10	3		42	53	7	18			170
Cuts, abrasions, infections	-	1	4	-	4		2	68	13	24			116
Insomnia	-	-	-	-	-		-	42	2	22			66
Body aches	-	2	-	5	-		2	21	8	5			43
Constipation	-	5	-	3	-		-	23	-	-			31
Earache, toothache	1	1	2	3	-		-	16	2	5			30
Fainting, dehydration	-	-	-	-	-		-	5	-	16			21
Miscellaneous (nervousness, diarrhea, allergic reactions)	2	4	6	9	4		9	18	6	14			72

<sup>a</sup> Two-week confinement<sup>b</sup> One-week confinement<sup>c</sup> Week-end confinement

### III. Medical Supplies

Medical personnel in experimental studies have made suggestions concerning needed additions for the medical kit. These suggestions are presented in Tables 78 and 79. On the basis of in-shelter physician and nurse recommendations in ES I-VIII, supplements were added to Medical Kit C in ES IX and X. The supplementary medical items are listed in Table 80.

### IV. Sanitation

General sanitation has consistently emerged as a public hygiene problem. Complaint factors included faulty siphon action of the water drum spout, lack of bathing facilities, unpleasant odors and leakage from the chemical commodes, and general uncleanness of the shelter area.

#### A. The Water Dispensing Spout

The prescribed method of water dispensing has been only partially successful in all experimental studies. Shelterees in ES I and II resorted to oral suction to obtain water from the metal drum. Subjects in ES III dispensed water by dipping a cup into a filled biscuit can. The situation improved in ES IV where the Shelter Manager used a large paper clip to maintain siphon action. However, it was noticed that the prescribed method of repositioning the hose into the water bag to recover siphon action created the hygienic problem of dirt being introduced into the water supply.

In ES VII an additional one foot added to the length of the hose in the new SK IV failed to alleviate the problem completely. When siphon action failed, the plastic bag liners were sometimes slit to provide manual adjustment of the siphon hose. Food tins were used to catch frequent water spillage during the dispensing process.

In ES VIII, IX, and X the method followed in ES III was popular, that of dipping a cup (with the holder's fingers in it) directly into the water drum, then pouring it into the recipient's cup. This method is obviously unsanitary and could become a health hazard.

To insure shelteree health it is essential that the utmost care be exercised in handling, storing, and using shelter food and water. Sanitary water dispensing remains a problem to be solved.

Table 78

Medications Suggested by Medical Personnel  
for Addition to Shelter Medical Kits  
(ES I, II, III, VI, VII, VIII, IX, and X)\*

Medications	ES I	ES II	ES III	ES VI	ES VII	ES VIII	ES IX	ES X
Antiemetic		X			X	X		
Sedative	X	X		X		X		
Stimulants for asthmatic or cardiac conditions			X	X	X	X		
Antiseptic		X			X	X		
Cough medication			X		X	X		
Analgesics					X	X		
Antibiotics		X				X	X	
Earm Medication		X				X		X
Plasma, blood volume expander, IV fluid	X					X		
Tetanus toxoid						X		X
Ammonia					X			
Antacid or anticholinergic					X			
Antihistamine			X		X			
Antispasmodic					X			
Oxygen						X		
Phenobarbital, elixir							X	X
Tranquillizers								X

\* No additional items were suggested in ES IV and V.

\* Antibiotics in addition to those stocked in Medical Kit C.



Table 79

Supplies Suggested by Medical Personnel for Addition  
to Shelter Medical Kits  
(ES II, III, VI, VII, VIII, IX, and X)<sup>a</sup>

Supplies	ES II	ES III	ES VI	ES VII	ES VIII	ES IX <sup>b</sup>	ES X <sup>b</sup>
Band-Aids, adhesive tape	X	X	X	X	X	X <sup>c</sup>	X <sup>c</sup>
Splints				X <sup>c</sup>	X <sup>c</sup>	X <sup>c</sup>	X <sup>c</sup>
Thermometers and Containers				X	X	X	X
Airways				X	X	X	X
Childbirth Kit				X	X	X	X
Cleansing Agent				X	X	X	X
Cups, folding paper				X	X	X	X
Basin				X	X	X	X
Cot				X	X	X	X
Flashlight				X	X	X	X
Forceps, small tipped				X	X	X	X
Infant Supplies				X	X	X	X
Medicine Cup				X	X	X	X
Milk, powdered				X	X	X	X
Needles, disposable				X	X	X	X
Notebook, looseleaf				X	X	X	X
Paper Towels				X	X	X	X
Soap, liquid antibacterial				X	X	X	X
Stretcher				X	X	X	X
String				X	X	X	X
Sugar, cubes				X	X	X	X
Syringes, disposable				X	X	X	X
Tourniquet				X	X	X	X

<sup>a</sup>No additional items were suggested in ES I, IV and V.

<sup>b</sup>Kits were supplemented with recommended items for these studies.

<sup>c</sup>In addition to those already stocked in Medical Kit C.

Table 80

CDR Supplementary Medical Kit Provisions  
(EE IX and X)

Item	Amount Stocked	
	EE IX	EE X
Adhesive tape		
2" x 5 yds.	1 roll	Same
4" x 10 yds.	2 rolls	Same
Ammonia, aromatic 12s	1 box	Same
Antiseptic (Aqueous Zephiran) 8 oz. 1:750	--	1 btl.
Artificial Respiration tube	2 (adult)	Same
	2 (child)	Same
	3 boxes	Same
Band-Aids, 56 assorted	--	1
Basin, plastic	1 btl.	Same
Benadryl, 25 mg./50s	4 btl.	Same
Benadryl, elixir, 4 oz.	2 btl.	6 btl.
Benylin Expectorant, 4 oz.	1	Same
Cot, aluminum folding	--	8 btl.
Cough Medication - Sudafed 4 oz.	1 box	Same
Cups, folding paper, medicine, 1 oz. 100s	1 btl.	Same
Dextran, 6% w/v in Dextrose 5%, 500 ml.	1 btl.	Same
Dextrose, 5% in water, 1000 ml.	12 tabs.	Same
Dramamine	2 pkgs.	Same
Ephedrine Sulphate Injection, 1 ml./125	1 vial	Same
Epinephrine Injection, 1 fl. oz., 1:1000	1	Same
Forceps, small tip	3 tubes	Same
Furacine Soluble Dressing, 28 gms.	--	3 sets
IV Tubing (Solution Administrative set)	1 pkg.	Same
20 g. x 1 (1/2"), vein needle	1 vial	Same
Milk, powdered	1	Same
Morphine, 10 cc., 16.2 mg./cc.	--	1
Notebook, looseleaf	--	5 btl.
Oxygen, unit	--	2 pkgs.
Salt 1000s	1 btl.	Same
Sedative (Phenobarbital, sodium) 12s	--	1
Sodium Chloride Injection, 1000 ml.	--	1 roll
St. ... Light (flashlight and 2 batteries)	--	1 box
St. ... 250 feet	15	Same
Su. ... 1 lb.	6	Same
Syringe, plastic, 2 1/2 cc., 25 g.	2	Same
22 g.	3	Same
Thermometer Container, plastic	--	1
Thermometer, oral		
Tourniquet		

#### R. Lack of Bathing Facilities

The lack of bathing facilities imposed by shelter confinement provoked complaints in all experimental studies. The problem of personal cleanliness was, of course, more pronounced in the longer studies.

Although water was dispensed for drinking purposes only, shelterees in ES II "bathed" with a little of the drinking water, using surgical soap from the medical kit. Subjects in ES III also sponge bathed with extra drinking water, using handkerchiefs. In ES V, alcohol and gauze pads from Medical Kit A were used for cleaning hands.

In the 300-person studies no water was made available for sponge baths, and "no bathing" was indicated as a primary complaint in ES VII and VIII, as well as a complaint of 41% of shelterees in ES VI.

Having to wear the same clothes and being unable to wash hands and face were cited as the major reasons the lack of bathing facilities was so keenly felt. Body odors were mentioned in all the studies as a source of irritation, although women were more acutely aware of this problem.

Apparently the inclusion of the hand cleaner did not prove psychologically beneficial. Designed to sanitize rather than clean, the provision did not remove the appearance of dirt and left a "greasy" covering on the hands. Also, the hand cleaner was used excessively except when controlled.

#### C. General Shelter Uncleanliness

Shelterees have repeatedly complained that the shelter area in general was unclean. Lack of janitorial supplies contributed significantly to this sanitation problem. In ES VIII brooms, mops, and rags were stocked. Prior to this inclusion, shelterees had attempted to sweep the floor with corrugated fiberboard.

In ES IX both a mop and a broom were stocked in the shelter. A serious health hazard became evident when the mop which had been used in the commode area was used elsewhere in the shelter, creating both an odor and a sanitation problem. Shelterees in ES X were instructed in the Handbook to restrict the use of mops to commode areas.

#### D. Other Health Hazards

The identification of paper cups, which must be retained by individuals throughout the shelter stay, is necessary to insure private usage and to prevent the spread of disease. Writing names

on the lids and/or bottoms of the cups with pencil or lipstick was attempted with only partial success. Shelterees found that the pencil marks remained visible longer than those made by lipstick. It has been suggested that a felt-tip marker be included in supplies.

Although adequate for the purpose intended, the can opener provided in the sanitation kit left jagged edges on the food tins, creating a safety hazard. Several shelterees have reported receiving cuts from the sharp edges. It has been recommended that the butterfly-type can opener be stocked.

#### V. Nutritional Aspects of Shelter Food

An important aspect of ES II involved a test of the physiological effects of the OCD survival food stocked in shelters. In this two-week confinement, blood tests and urine analyses were made on the use of the bulgur wheat wafer. The nutritional analyses were made by the School of Veterinary Medicine at the University of Georgia and the U. S. Army Medical Research and Nutrition Laboratory, Fitzsimons General Hospital, Denver, Colorado. Blood samples were drawn at the beginning and the end of the confinement period; twenty-four hour urine specimens were collected on four days throughout the study. (See 1962-63 Final Report for details.)

Clinical evaluation of the statistical changes in blood and urine revealed no serious dietary effects. (See Table 81). It was concluded that the bulgur wafer, or similar food, presently stocked in community fallout shelters is adequate for sustaining healthy men, women, and children within the age range and under the conditions of ES II.

#### VI. Conclusions

##### A. Medical Complaints

1. Predominant medical complaints included headaches, colds, and sore throats, stomachaches, nausea, cuts and abrasions.
2. Female shelterees registered more medical complaints than did male shelterees.
3. Frequency of medical complaints decreased as occupancy continued.

Table 81  
Nutritional Analysis of the Bulgur Wafer  
(ES II)

Analysis	Variable	p	Comparison
<u>Blood Tests</u>			
Vitamin A		n.s.	
Carotinoid	Pre-post	<.02	Drop
Vitamin C	Pre-post	<.001	Rise
	Pre-post X Sex	<.001	Male rise>female rise
Hematocrit	Sex	<.02	Male/female
Hemoglobin	Sex	<.05	Male/female
	Pre-post	<.005	Rise
	Pre-post X Sex	<.05	Male rise>female rise
MCHC <sup>a</sup>	Pre-post X Sex	.06	Male rise>female drop
Plasma Protein	Pre-post	<.001	Rise
	Pre-post X Sex	<.05	Female rise>male rise
Erythrocyte			
Riboflavin	Pre-post	<.01	Rise
Blood Non-protein	Pre-post	<.005	Rise
Nitrogen	Pre-post X Sex	.06	Male rise>female rise
<u>Urine Analysis</u>			
Urine Excretion	Sex	<.005	Male>female
	Pre-post	<.001	Drop
Urinary Creatinine	Sex	.10>p>.05	Male>female
	Pre-post	<.01	Rise
Urine Specific Gravity	Pre-post	<.001	Rise
Urinary Riboflavin, Vit. B <sub>2</sub>	Pre-post	<.01	Drop
N'Methylnicotinamide	Sex	.06	Female>male
	Pre-post	<.01	Rise
Urinary Niacin, Vit. B Complex		n.s.	
Urinary Thiamine, Vit. B <sub>1</sub>	Pre-post	<.05	Drop

<sup>a</sup> Mean corpuscular hemoglobin concentration.

B. Medical Supplies

1. The OCD Medical Kit appeared adequate under the conditions tested.
2. Shelter medics suggested many additional medical supplies for use under emergency conditions.

C. Sanitation

- 1 Sanitation problems occurred in all studies because of a lack of washing facilities, leakage from chemical commodes, unsanitary food and water dispensing procedures, and general shelter uncleanness.
2. Packaging the carbohydrate supplement in small quantities within the metal container would facilitate sanitary dispensing of this item.
3. Mops and brooms are important for general shelter cleanliness.

D. Nutrition

The bulgur wafer, or cereal food with similar nutrient content, appears adequate for maintaining health for a two-week shelter stay.

## Chapter 12 - Defections

Provisions have been made for shelterees requesting release prior to the scheduled departure time throughout the experimental program. Of the 1,742 persons participating in ten studies, two hundred and fourteen shelterees (12.3%) defected. The sixth experimental study was unique in that no recruited shelterees requested an early exit.

Both a Medical Defection Report and a Defection Interview Report were completed for each defecting shelteree. The in-shelter physician submitted the Medical Report for the shelteree, whether or not medical complaints were involved. The CDR staff interviewed each defecting shelteree to determine reasons for leaving.

Defections have been classified as "medical" or "non-medical," depending on the conditions under which they occurred. Shelterees leaving the shelter on advice from the medical staff were designated "medical" defectees; of the total two hundred and fourteen defectees, only thirty-two were medical. Those leaving otherwise, including those who left to accompany others, were classified as "non-medical" defectees (see Table 82).

### I. Defections in Two-Week Occupancy Studies

During the three two-week confinement studies, fifteen shelterees of ninety participants exited prior to schedule (see Table 83). Half of these defections (8) were children, although children composed only 29% of the total population.

Although several of the children who exited early complained of nausea, few presented serious medical reasons for defection. In many cases homesickness was either stated or implied. Most of the children in ES II, III, and V were not accompanied by their parents.

Experimental Study II: During this two-week study there were five defections (age, males: 39, 11; age, females: 10, 12, 13). Primary reasons were aches, nausea, and psychological maladjustment.

Experimental Study III: Defections dropped to two in this two-week study (age, male: 11; age, female: 24). The female shelteree had concealed a pregnancy and exited because of nausea. The other defectee was a young boy who could not socially adjust to the group.

Experimental Study V: Eight subjects left the shelter before study completion. Of this number, three exited upon recommendation of the shelter nurse: a 60-year-old woman felt nauseated and thought she might have a heart attack; a 64-year-old man developed a severe

Table 82

Number and Nature of Defections  
(ES I-X)

Experimental Study	Number of Shelterees	Number of Defections	Nature of Defection		
			Medical*	Non-Medical	To Accompany Other Defectors
ES I	30	8	0	7	1
ES II	30	5	1	4	0
ES III	30	2	1	1	0
ES IV	30	12	4	8	0
ES V	30	8	3	5	0
ES VI	300	0	0	0	0
ES VII	307	62	11	37	14
ES VIII	321	8	3	2	3
ES IX	160	22	0	15	7
ES X	504	87	9	50	28
Total	1,742	214(12.3%)	32(1.8%)	129(7.4%)	53(3.0%)

\* Under fallout conditions, the criteria for any medical defection would obviously be far more rigid than in this experimental situation.



Table 83  
Number of Defections in Two-Week Occupancy Studies  
(ES II, III, and V)

Experimental Study	Number of Shelterees	Number of Defections	Defections			
			Adults		Children*	
			Male	Female	Male	Female
ES II	30	5	1	0	1	3
ES III	30	2	0	1	1	0
ES V	30	8	3	2	0	3
Total	90	15	4	3	2	6

\* Age 15 and under.

cold and high fever; another woman, 38 years old, developed an abscessed tooth halfway through the confinement period. The three children who defected seemed to be bothered by homesickness. The other two defections were adult males who experienced difficulty in adjusting to shelter living.



## II. Defections in One-Week Occupancy Studies

During the one-week occupancy studies, including the ES I four-day study, eighty-two out of three hundred and sixty-seven shelterees exited prior to the scheduled departure date (see Table 84). While the shelter population was almost evenly divided between children and adults (51.2% of the shelterees were children). More than half (60.5%) of the defectees were children. More females than males defected.

Experimental Study I: Conditions in this four-day, thirty-person study were the most austere of all studies. Eight shelterees defected. Reasons for defections included psychological instability, bodily complaints, (e.g., headaches and body aches, constipation, dizziness), odor, and hard floor.

Experimental Study IV: During this one-week children's study, eleven of the children exited early, as well as the original shelter manager (age, males: 7, 8, 9, 9, 33; age, females: 7, 8, 8, 8, 9, 11, 11). Homesickness accounted for most of these defections, followed by colds and nausea; few presented serious medical reasons. The Shelter Manager apparently could not control the group and requested release. He was replaced by an alternate Shelter Manager who remained in the shelter until the scheduled exit.

Experimental Study VII: Sixty-two defections occurred during this one-week confinement period. Fifty-one of these defections were for non-medical reasons, including homesickness, bad shelter conditions, and departure of other family members; fourteen of the fifty-one left when one or more family members defected. Only eleven or 18% of the defections occurred for medical reasons. The largest percentage of medical defections were from the 1-5 age group.

Table 84  
Number of Defections in One-Week Occupancy Studies  
(ES I, IV, and VII)

Experimental Study	Number of Shelterees	Number of Defections	Defections			
			Adults		Children <sup>a</sup>	
			Male	Female	Male	Female
ES I <sup>b</sup>	30	8	4	4	0	0
ES IV	30	12	1	0	4	7
ES VII	307	62	7	17	17	21
Total	367	82	12	21	21	28

<sup>a</sup>Age 15 and under.

<sup>b</sup>A four-day test.

As compared with males, as many or more females defected in each age range. Females accounted for 61.3% of the defections; males, for 38.7%. Of the shelter population, 54.7% were females, and 45.3% were males.

Seventy-four percent of the defections were 20 years of age or less. Thirty-four or 55% of the defections were between the ages of 6 and 15; however, eleven of these left because other family members defected and three because a close family member died. The group of shelterees aged 21-30 accounted for only 3% of the defections (2 out of 62). No one over 47 years of age defected, although there were thirteen such people in the shelter.

Several attempts to identify variables significantly related to defections were undertaken in ES VII. At the time of entry and again on the last day of the shelter stay, shelterees were asked to complete a personal possessions inquiry. It was found that, in general, those who defected listed fewer items than non-defectees, and that defectees carried more non-essential and fewer essential items than did those who did not defect.

Chi-Square tests were applied to the relationship of such variables as newspaper reading habits, income, and Civil Defense knowledge of those persons who defected. No significant findings were indicated.

It was hypothesized that non-defectees had coped with more past difficulties, and that this experience helped them endure shelter stress. Defectors, on the other hand, might be those who lacked experience in dealing with group difficulties, and who would be more likely to leave. A Chi-Square test of statistical significance supported the hypothesis. That is, non-medical defectors had not coped with as many family problems as those shelterees who endured the shelter stay. Family problems experienced by the latter group were: (1) death of a family member, (2) divorce, (3) mental illness, (4) medical operation, (5) unemployment, (6) imprisonment, (7) school dropout, (8) alcoholism, and (9) general family problems.

### III. Defections in Weekend Studies

One-hundred and seventeen shelterees defected from a total of 1,285 shelterees in four weekend confinement periods (see Table 85).

Experimental Study VI: Although defections among the recruited shelterees were anticipated in this 300-person study, none occurred. Three primary explanations are offered here. First, the highly-selected and trained shelter management resulted in good shelter control and organization. Second, a well-planned in-shelter activity program contributed to morale. Third, the management staff placed strong emphasis on remaining the full duration of the study.

Table 85  
Number of Defections in Weekend Studies  
(ES VI, VIII, IX and X)

Experimental Study	Number of Shelterees	Number of Defections	Defections			
			Adults		Children	
			Male	Female	Male	Female
ES VI	300	0	0	0	0	0
ES VIII	321	8	3	3	0	2
ES IX	160	22	7	5	5	5
ES X	504	87	22	26	16	23
Total	1,285	117	32	34	21	30

\*Age 15 and under.

Experimental Study VIII: A total of eight shelterees left the shelter before the scheduled exit. Three shelterees defected for medical reasons. Three of the remaining five were not bona fide defections in the sense that their only reason for leaving was to accompany a sick family member unable to adapt to the shelter situation. The other two defectors felt so uncomfortable that they left before the departure time.

Experimental Study IX: Of the twenty-two shelterees defecting, fifteen left within twenty-four hours of entry. Seven of the twenty-two left to accompany a family member who defected. Twelve dissatisfied individuals were responsible for the total twenty-two defections. Shelterees complained of overcrowding, high temperatures, and uncomfortable sleeping conditions due to the reduced space allotment variable of this study. No shelteree left because of medical reasons; and as judged by the physicians, there were no medical problems which warranted early exit. Item analysis of the questions which had previously differentiated defectees from non-defectees did not indicate significant differences.

Experimental Study X: Eighteen families, four married couples, and twelve individuals formed the group of eighty-seven shelterees who left the shelter before the scheduled exit time. Although the shelter population was approximately 13% Negro, no Negro participant defected. The ages of defectors ranged from 1-70 years with a mean age of 22 years.

Nine persons claimed medical problems for early exit, of which only eight were listed as such by the physician. Fifty were categorized as psychological defections, accompanied by twenty-eight family members. Reasons most frequently listed were "too crowded" and "to accompany others defecting." The ES VII finding that shelterees who stayed had experienced a greater number of family problems was not replicated in ES IX or in ES X.

#### IV. Comparison of Adults with Children, Males with Females

In reference to the variables of sex and age, Table 86 presents an overall comparison. The overall difference between the number of adults and child defections is statistically non-significant. It should be noted that in the larger studies, composed mainly of family groups, several children frequently left with one or more adults. It is interesting that parents have a tendency to offer as their excuse for leaving the condition of their children who themselves often seem content to remain.

These figures also lend no support to any overall generalization that females are more likely to defect than males (Chi-Square tests non-significant).

Table 86  
Comparison of Children with Adults and Males with  
Females Defecting in Ten Experimental Studies<sup>a</sup>  
(ES I-X)

Shelterees	Shelteree Population		Defection Population	
	Number	Percent	Number	Percent
Children <sup>b</sup>	766	44.0%	109	51.0%
Adults	976	56.0%	105	49.0%
Total	1,742	100.0%	214	100.0%
Males	795	45.6%	92	43.0%
Females	947	54.4%	122	57.0%
Total	1,742	100.0%	214	100.0%

<sup>a</sup>Chi-Square tests comparing males with females and adults with children, in terms of defectors and those who stayed, were non-significant.

<sup>b</sup>Age 15 and under.

## V. Early Defections

Defections seem to occur largely during the first forty-eight hours of a study (Table 87). Are the prior phases of pre-processing and shelter entry related to early defections?

With regard to a relationship between duration of the temporary phase and early defections, no persistent trend can be confirmed. Table 88 shows the length of both the pre-processing period and the temporary phase of ES VII-ES X with an indication of the number of shelterees defecting within the first 24-hour period. Of these four studies, the 160-person ES IX had the shortest temporary phase, as well as the shortest period of pre-processing. In spite of this 72.7% of the total defections in ES IX occurred within the first 24 hours. One confounding variable here, however, is the more crowded condition of ES IX; shelterees were allowed only 6-7 square feet per person.



## VI. Defections and Space Allotment

One factor particularly relevant to defections is the amount of square footage allowed each shelteree in the various studies. Shelterees in ES VI, VII, and VIII were allotted 10 square feet per person. In addition, shelterees in ES VI carried neither bedding nor supplies into the shelter (leaving more space for utilization) than participants in ES VII-X. Shelterees in ES IX were given only 6-7 square feet, and defections were relatively high. Eight square feet per person was an experimental variable in ES X, and consequent space shortage with inclusion of personal possessions became a serious problem. See ES X write-up on the space problem encountered during the temporary phase, discussed earlier in this report.

## VII. Implications of Defections in the Event of Nuclear Attack

Of the two hundred and fourteen defectors only thirty-two have been classified as medical. Mild psychological problems and various physical complaints accounted for most defections. This fact, of



Table 87

Frequency of Defections Within First Forty-Eight  
Hours in Ten Experimental Studies  
(ES I-X)

Experimental Study <sup>a</sup>	Frequency of Defections										Total Defections <sup>b</sup>
	0-6 Hrs.	7-12 Hrs.	13-18 Hrs.	19-24 Hrs.	25-30 Hrs.	31-36 Hrs.	37-42 Hrs.	43-48 Hrs.	48+ Hrs.		
ES I (N=30)	--	--	2	6	--	--	--	--	--	8 (26.7%)	
ES II (N=30)	--	--	1	--	1	--	1	--	2	5 (16.7%)	
ES III (N=30)	--	--	--	--	--	--	--	--	2	2 ( 6.7%)	
ES IV (N=30)	2	--	--	2	--	--	--	2	6	12 (40.0%)	
ES V (N=30)	--	--	--	2	--	--	--	2	4	8 (26.7%)	
ES VI (N=300)	--	--	--	--	--	--	--	--	--	0	
ES VII (N=307)	4	2	--	--	24	1	--	--	31	62 (20.2%)	
ES VIII (N=321)	--	--	--	5	--	--	--	3	--	8 ( 2.5%)	
ES IX (N=160)	--	--	4	12	6	--	--	--	--	22 (13.8%)	
ES X (N=504)	59	--	12	5	6	--	5	--	--	87 (17.3%)	

<sup>a</sup>ES I was a four-day study; ES II, III and V were two-week studies; ES IV and VII were one-week studies; and ES VI, VIII, IX and X were weekend studies.

<sup>b</sup>Since a percentage should be computed on a base of 100, percentages for ES I-V are not as statistically reliable as others.

Table 88

Frequency of Defections Within First Twenty-Four Hours  
Compared with Duration of Pre-Processing and Temporary  
Phases In Untrained Management Studies  
(ES VII-X)

Experimental Study	Pre-Processing Period	Temporary Phase*	Frequency of Defections				Total Defections	
			0-6 Hrs.	7-12 Hrs.	13-18 Hrs.	19-24 Hrs.	Number	Percent
ES VII (N=307)	4 hours 10 min.	4 hours	4	2	--	--	6	9.7
ES VIII (N=321)	3 hours 20 min.	3 hours 30 min.	--	--	--	5	5	62.5
ES IX (N=160)	2 hours 15 min.	1 hour 50 min.	--	--	4	12	16	72.7
ES X (N=504)	3 hours 45 min.	3 hours 29 min.	59	--	12	5	76	87.4

\*Figures include time of "transition" phase.

course, indicates that certain people find themselves unable to endure such a hardship situation even when they are assured remuneration.

Although it is difficult to generalize from the present sample of defections, it is possible that a certain percentage of these people might leave the shelter even in the event of a nuclear disaster. Since radiation is neither seen nor felt, there may be those who do not understand the importance of remaining in the shelter and demand release. It is also feasible that some discontented shelterees might entertain the notion that other shelters are perhaps more comfortable and attempt to relocate. Others, panicked by confinement, may become irrational in their desire to escape.

Such speculation raises the question of posting a security guard at the shelter exit and whether such individuals should be allowed to leave or be restrained.

Although the above considerations are plausible, the studies managed by untrained personnel, ES VII-X, yield no data from which concrete solutions can be drawn.

#### VIII. Complex Nature of Defections

Probably the effectiveness and the extent of organization in the shelter is a significant variable affecting the incidence of defections. It seems reasonable to infer that the more effective the shelter management and the channels of communication to the shelterees, especially during shelter entry, the fewer are the defections that will be likely to occur. Competent leadership as well as a feeling of organization among shelterees would probably discourage potential defectors.

#### IX. Conclusions

- A. Defections result from a complex interplay of variables, many of which are difficult to isolate and abstract from the overall study design. Among these variables are management efficiency, space provision, shelteree attitude, and environmental austerity.
- B. Shelterees who defected were found to have brought fewer essential personal survival possessions than shelterees who completed study confinement.

## Chapter 13 - In-Shelter Activities

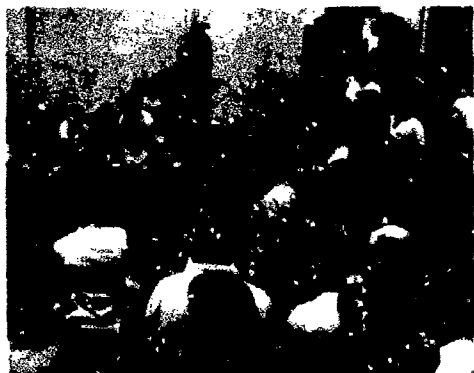
### I. Emergency Operating Center

Although simulated radio broadcasts were employed in previous studies, an EOC program was not initiated until ES VIII. Messages designed to obtain information which would be needed in a real emergency, e.g., radiological inputs, as well as information for testing the adequacy of the Handbook were transmitted by telephone. A similar program was conducted in ES IX. For this study, the shelter public address system was used. Telephones were again used in ES X, as well as a wired CDV-715 meter to transmit radiological readings.

Examples of the kind of information requested from the shelterees through the EOC program follow: When did you first detect an increase in the radiation level? What was the reading? Are there enough supplies stocked in your shelter to feed you? Are there any civil defense workers in your shelter? If so, what training have they had? Give us the staff positions and names of all your shelter staff members. The role of the Emergency Operating Center and its place in the overall Community Shelter Plan requires continued research and further development.

### II. Training

Training material on subjects related to problems of confinement and post-attack conditions; e.g., "Sanitation and Waste Disposal," "Radiation and Decontamination Procedures," were made available to the shelterees in all CDR studies. Training lectures were most frequently delivered by the Shelter Manager in the early studies. However, in later studies a Director of Training was established whose duties included adapting training material for lectures, scheduling training periods, and recruiting lectures and discussion leaders from among the shelterees.



Training methods varied according to the configuration and the population of the shelter. Lectures were presented within sections during ES VI, but distraction from other groups made attention difficult. Although the Handbook again recommended that lectures be given in small groups, in ES VII all were held in one large room. Little discussion followed, and shelterees later complained of not being able to hear the lecturer.

Lectures were delivered on each of the two floors of the shelter in ES VIII. Perhaps because shelterees preferred not to be confined in closer quarters to attend shelter-wide training sessions or because lecturers were well-selected and presented the material in an interesting manner, training sessions were received with more enthusiasm in this test than any other large group study.

It has been observed that for short periods of experimentally simulated confinement, interest in training sessions is generally low, and attendance as well as attention declines as the study continues. However, in a nuclear situation, the value of emergency training would likely be more appreciated and shelteree survival interest greater.

Therefore, training material and suggestions for training methods should be a vital part of a shelter handbook. A list of such topics is presented in Table 89.

### III. Sleep

Since sleep conditions should greatly affect the well-being of shelter occupants, and since OCD stocks do not include sleep items, investigation of this area has been given consideration in all CDR occupancy tests.

In ES I, a four-day test, shelterees were required to sleep on an uncovered concrete floor. Despite numerous complaints precipitated by this austerity, no adverse physical effects resulted, other than body soreness. Corrugated fiberboard for sleeping pallets was introduced in ES II and for each successive study through ES VI this item was stocked as a shelter supply. Beginning with ES VII, shelterees were permitted to bring personal possessions into the shelter. Sleeping equipment was among the items most frequently brought. With the introduction of bedding, discomfort caused by hardness of the floor was lessened while the problem of lack of space, particularly during the sleep periods, became more intensified.

In the earlier thirty-person groups (ES I-V), shelterees themselves made efforts to relieve some of the sleeping discomforts by experimenting with different arrangements. A handbook for shelter management was designed for use in ES VI, the first large group study, in which the shelter staff was instructed to employ several

Table 89

Training Topics Included in the  
Civil Defense Research Shelter Handbook

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Lecture  
Number

Topic

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- 1 - Adjustment to Shelter Life
  - 2 - Staff Organization
  - 3 - Nuclear Explosions, Fallout, and Radiation
  - 4 - Protection from Radiation
  - 5 - Emergency Operating Center
  - 6 - Shelter Sanitation
  - 7 - Shelter Accident Prevention
  - 8 - Shelter Fire Safety
  - 9 - First Aid I: Fundamental First Aid and Artificial Respiration
  - 10 - First Aid II: Termination of Bleeding and Prevention of Shock
  - 11 - Worker Safety Measures
  - 12 - Water Pipe Tapping and Other Sources of Water Supply
  - 13 - Water Decontamination
  - 14 - Water Purification
  - 15 - Food Decontamination
  - 16 - Waste Disposal
  - 17 - Rural Decontamination
  - 18 - Suitable Crops for Contaminated Land
  - 19 - Use of Contaminated Livestock and Feeds
  - 20 - Post-Attack Food Distribution Plan for Georgia
  - 21 - Public Sanitation
-

sleep patterns during confinement. Total sexually-segregated sleeping (all males on one side of the shelter and all females on the other) proved to be unpopular; and, thereafter, a partially segregated plan (families in the middle, single males and females on either side) was recommended in the Handbook. In most studies, management was ineffective in controlling sleeping and napping arrangements, and aisle space sufficient for adequate movement about the shelter at night was rarely maintained.



Shelterees in ES IX followed a shift-sleeping plan the first night but abandoned this pattern in favor of segregated sleeping in which families slept in the middle of the shelter area with single males and females on either side. Although this arrangement seemed to be satisfactory, "poor sleep conditions" appeared first on the list of discomforts, probably due to the reduced space allotment factor. In contrast to this organized arrangement, shelterees in ES X had little regard for sleep plans (some paralleled head to toe sleeping in family groups was observed), and "poor sleep conditions" appeared in fifth place on the discomfort list.



#### IV. Time Perception

In two studies shelterees were asked to make time judgements following sleep periods. Time perception was a variable in ES III, a study involving thirty people--men, women and children, ages seven through sixty-six; and in ES IV, a study involving twenty-eight elementary school children, ages seven through twelve. Both studies attempted to evaluate the effects of confinement upon the ability to maintain relative accuracy of time over an extended period. The studies further evaluated the influence of age, sex, I.Q., time of day and days of confinement upon time perception.

Prior to entry, the shelterees relinquished all pocket and wrist watches; hence, there was no external means of telling time. Furthermore, in ES III, the conditions of the shelter precluded the possibility of night or day time cues. The shelterees made time estimates which they recorded in morning and evening diaries. The Shelter Manager pressed a buzzer at these times to signal the shelterees to record their time judgements. The buzzer also served to signal the outside staff observers to record the actual time, the correct time was sent into the shelter only if the mean time estimate deviated plus or minus three hours from actual time. Twice the shelterees received feedback concerning actual time (Thor, D. H., and Crawford, M. L. J., 1964).



ES III furnished several significant conclusions. It was determined that a group of shelterees can maintain relative time accuracy over an extended period lacking external time cues. It was further determined that the confinement effect upon time perception was U-shaped with a depression of estimates during mid-confinement. Age groups differed significantly in time estimates made during the morning but, I.Q. and sex did not exert a significant influence upon time of day estimates.

ES IV was conducted in the same manner as ES III; however, in addition, time estimates were made of short intervals on the order of four to twenty seconds. The shelterees were required to judge the duration of light and auditory stimuli which were presented by means of a buzzer and light bulb. Each shelteree made time of day and visual and auditory duration estimates three times daily.



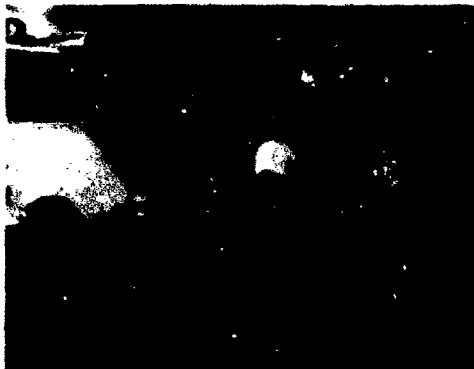
In the first three days of confinement, shelterees overestimated the actual time of day, while the last three days they underestimated the passage of time.

A significant I.Q. effect was found between absolute mean deviations from true time of two I.Q. groups. The low I.Q. group made greater mean absolute errors estimating time of day on all but the fourth day. Age and sex groups did not differ significantly in time of day estimations. (Hammes, J. A., and Osborne, R. T. et al., 1963.)



#### V. Feeding

CDR occupancy studies endeavored to determine the minimum daily caloric intake necessary for shelterees to maintain good health. In the first seven tests only OCD supplies were present in the shelter; i.e., bulgur wafers, Nabisco biscuits, Nebraska crackers, and water. In the early experiments the usual practice was to test the efficiency of one type of cracker per study; therefore, not every type of OCD cracker was stocked for each study. A carbohydrate supplement in the form of candy was introduced in ES IV. Although the candy served as a source of energy, it was found that overconsumption could cause mouth soreness. Beginning with ES VIII, food adjunctive to that provided by OCD was brought into the shelter.



Different feeding schedules were tested. The most efficient procedure was found to be a four-food distribution system and a six-water distribution system daily. Two distribution methods have been used; i.e., the fixed point--wherein all shelterees go to a central stationary point to receive food, and the moving point--wherein the Section Leaders bring the food to the people in their sections. The latter procedure appeared to be the more effective method for maintaining order during distribution periods in the larger studies.

Although shelter diaries show that food has always been a source of many negative comments, it has been demonstrated that shelterees can survive on OCD stocked supplies for two weeks without adverse effects.



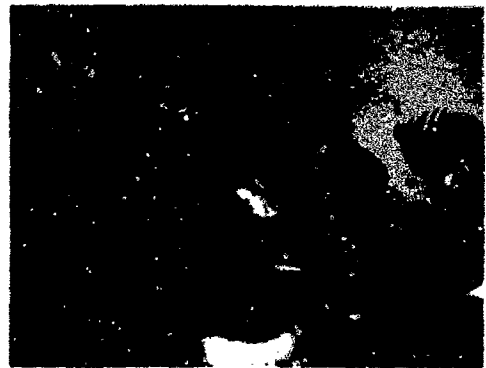
## VI. Nursery

Nurseries were not utilized in ES I-V. As discussed elsewhere in this report, ES IV was a simulated school situation, with all but two shelter occupants being children. In the remaining thirty-person studies, adults spontaneously entertained the children and supervised their care, and in some tests, their schooling.



Organized nursery periods were instituted in ES VI to free adults for training sessions and to relieve parents of the constant care of their children. Nurseries were divided into age groups which varied according to the child population. Adults and teenagers directed the nursery program.

Although children as well as adults benefited from the diversion provided by a nursery, in most studies this recreation was offered only during the training periods, and in ES X scheduled only during the shelter-wide worship service.



#### VII. Recreation and Exercise

All CDR occupancy studies have included some form of recreation and exercise. Recreation and exercise were not always part of an organized program but were often individual, spontaneous, and informal undertakings. In ES I, II, III, and V, games such as cards, bingo, and checkers were improvised by the shelterees and used as recreational items. With the exception of ES VIII and IX, group singing was a frequent diversion. In ES VI and X, the PVK bicycle gave children as well as adults an opportunity for exercise. A talent show was held during ES III, VI, VII, VIII, and IX; and a play was presented during ES V. ES III, a two-week study, offered the greatest variety of entertainment--a square dance, May Day celebration, make-shift circus, mock wedding, mock divorce trial, and farewell banquet.

Bodily activity and behavior patterns were measured in ES II and III, to determine the effects of a two-week fallout shelter confinement under conditions of austerity. Observers worked in four-hour shifts around the clock. Counts were taken every fifteen minutes throughout each study of body positions (standing, sitting, lying), and of activities (sleeping, exercise, eating, recreation, training, conversation, and quiet). All shelterees were assumed to fall into one of the above mentioned body positions and activity categories. The frequency counts attempted (1) to establish a means of detecting the onset of fatigue, depression, and withdrawal symptoms for the group as a whole, (2) to provide an over-all picture of position and

activities of the group throughout occupancy, and (3) to determine relative amounts of time devoted to various activities by the group.



Both studies were strikingly similar in their tabulations regarding body positions and activity patterns, indicating reliability of measurement. Approximately half of the occupancy was spent in the lying position, slightly more than one-third in the sitting position and about one-sixth in the standing position. (Hammes, J. A., and Watson, J. A., 1965).



The most time consuming activities in order of magnitude were sleep, quiet reflection, conversation, and recreation. It may be concluded that the groups evidenced a relatively consistent pattern of behavior, and that no signs of adverse fatigue effects as a result of confinement were detected.

#### VIII. Religious Activities

Bibles were brought into the shelter for individual worship and meditation, and shelter-wide vespers were a part of the activities in ES III through ES VIII.



Non-denominational Sunday devotionals lasting five to thirty minutes were conducted in all studies. Scripture readings, prayers, and hymns were included in all but the children's study (ES IV) in which only hymns were sung. In all but one test, the devotional was directed by laymen. However, two ministers among the shelter occupants conducted the service in ES IX.



Enthusiasm for religious activities varied. Shelterees in ES III displayed creativity in preparing a church setting despite limited materials; and, in ES VI a children's choir was organized and rehearsed on Saturday in preparation for the Sunday service. In contrast, shelter occupants in ES I held a religious observance lasting only five minutes.

Religious activities in the shelter served as a boost to morale, and appeared to increase the shelterees' tolerance for each other and confinement conditions.

#### IX. Daily Schedule

The Shelter Manager in the earlier studies (ES I-ES VI), who was given some training prior to entry, planned each day's activities.

With the introduction of the Handbook a suggested daily schedule, based on the findings of the earlier tests, was included. (See Table 90.) A compilation of the activity schedules of all ten studies is found in Table 91. From this table certain similarities in all ten schedules may be seen. The times for waking and going to sleep were approximately the same in all studies, as was the time for early afternoon rest. One of the more interesting differences is the time that a Sunday worship service was held; this time fluctuated from 8 A.M. to 3 P.M.

## X. Conclusions

### A. Emergency Operating Center

Shelter occupancy tests provide the opportunity for checking out EOC-shelter communications.

### B. Training

1. For large shelter populations, small group presentation is preferable to one centralized training lecture.
2. Short training periods, twenty-thirty minutes in duration, given twice daily, are more effective than larger and more frequent lecture periods.

### C. Sleep

1. Shift-sleeping does not appear to be an effective sleeping arrangement for a one-room shelter.
2. Adequate aisle space is difficult to maintain during sleep periods.
3. Bedding diminishes the discomfort of sleeping on the floor, but introduces the problems of reduced space and supply storage.
4. Corrugated fiberboard pallets provide an uncomfortable but adequate sleeping surface, although blankets would be a valuable addition to shelter supplies.

### D. Time Perception

1. In the two-week studies, time passed rapidly during the first few days of confinement, and more slowly during the latter part of occupancy.

Table 90

## Handbook Suggested Shelter Schedule

Time	Activity
7:00 A.M. <sup>a</sup>	Arise Distribution of daily supplies to sections
8:00	Food and water distribution
9:00	Staff meeting and announcements
10:00	Water distribution
11:00	Training
12:00	Food and water distribution
1:00 P.M.	Rest
2:00	Training
4:00	Food and water distribution
6:00	Special activities
8:00	Food and water distribution
10:00	Water distribution 15-minute quiet period
11:00 <sup>b</sup>	Lights out

<sup>a</sup>Or whenever majority of shelterees are awake.

<sup>b</sup>Or whenever majority of shelterees are sleepy.

Table 91  
Daily Activity Schedule  
(ES I-X)

Experimental Study	Time of Day and Activity							
	7-9 A.M.	9-11 A.M.	11 A.M.-1 P.M.	1-3 P.M.	3-5 P.M.	5-7 P.M.	7-9 P.M.	9-11 P.M.
ES I	Arise Food, water dispensed Shelterees' temperatures taken	Training Devotionals* Diary distribution Exercise	Food, water dispensed	Rest	Conversation Reading	Food, water dispensed	Shelterees' temperatures taken Diary distribution Food, water dispensed	Lights out
ES II	Arise Blood samples taken Devotionals* Food, water dispensed	Recreation Exercise Training session	Urine collection Food, water dispensed	Rest-naps	Food, water dispensed Recreation	Special activities	Food, water dispensed	Lights out
ES III	Arise Food, water dispensed	Diary distribution Training	Food, water dispensed Quiet	Rest Informal activity Devotionals*	Food, water dispensed Lecture	Special recreation	Food, water dispensed Diary distribution	Lights out
ES IV	Arise Food, water dispensed	Diary distribution Group exercise Training	Food, water dispensed Rest Training	Recreation Exercise Food, water dispensed Hymn singing*	Games-exercise Food, water dispensed	Training Special activities Rest	Food, water dispensed	Food, water dispensed Lights out
ES V	Arise Group exercises Food, water dispensed	Diary distribution Schooling Devotionals*	Food, water dispensed	Rest Recreation-exercise Training	Food, water dispensed Leisure time	Food, water dispensed	Special events	Vespers Class Diary distribution Lights out

(Contd.)

(Contd.)



Table 91 (Contd.)

Experimental Study	Time of Day and Activity							
	7-9 A.M.	9-11 A.M.	11 A.M.-1 P.M.	1-3 P.M.	3-5 P.M.	5-7 P.M.	7-9 P.M.	9-11 P.M.
ES VI	Arise Staff meet- ing Exercises Food, water dispensed	Diary dis- tribution Sick call Recreation Exercise	Food, water dispensed Devotionals*	Rest Water	Food, water dispensed Games	Special activities Food, water dispensed	Staff meet- ing Food, water dispensed Vespers	Lights out
ES VII	Arise Food, water dispensed	Exercise Recreation Training Devotionals*	Water dis- pensed Training Nursery Food, water dispensed	Rest	Water	Special activities Food, water dispensed	Water Vespers	Lights out
ES VIII	Arise Food, water dispensed	Devotionals Training Water Nursery	Food, water dispensed Training	Rest Training Exercise	Food, water dispensed	Special activities Food, water dispensed	Water Diary dis- tribution	Group sing Prayers Lights out
ES IX	Arise Food, water dispensed Staff meet- ing	Diary dis- tribution Devotionals* Lectures Exercise Nursery	Food, water dispensed	Rest Training Informal activity	Conversation Leisure time	Entertainment Diary dis- tribution	Food, water dispensed	Lights out
ES X	Arise Food, water dispensed Staff meet- ing Lecture	Diary dis- tribution Devotionals*	Nursery Food, water dispensed Lecture	Exercise Singing Lectures Water	Food dis- pensed	Water Exercises Cleanup	Diary dis- tribution	Lights out

\* Sunday only.

\* Sunday only.

2. Activity and noise levels of groups provided with knowledge of time of day correlated highly with those of groups deprived of such information.

#### E. Feeding

1. When only OCD stocks are available, a daily six-water distribution system and four-food distribution system have been effective in encouraging shelteree consumption of survival-type rations.
2. For large shelter populations, sectional feeding is the more efficient procedure, whereas in small shelters central point distribution can be followed.

#### F. Nursery

1. The nursery concept has been found effective for temporary relief of parental responsibilities, in promoting better adult attention to training lectures, and in providing instructions and recreation for children as a group.
2. Responsibility for children must be assumed by some adult at all times.

#### G. Recreation and Exercise

1. Recreational programs have been found to be helpful to shelter morale.
2. In the two-week studies, behavioral activity declined from a relatively high level upon shelter entry to a low point midway in the studies.
3. In the two-week studies, approximately one-half of shelter time was spent in the lying position, one-third in the sitting position, and one-sixth in the standing position.
4. In the two-week studies no marked trends were noted in bodily positions and activity patterns, indicating a fairly consistent physiological state throughout confinement.

#### H. Religious Activities

Non-denominational Sunday services have been well received by shelterees.

#### I. Daily Schedule

In-shelter training, recreation, exercise, and religious services can be successfully conducted by untrained persons using Handbook material.

## Chapter 14 - Shelteree Reactions

In addition to the testing of OCD supplies and a proposed shelter handbook, physical and psychological reactions of shelterees were examined. The sources of data for the study of shelteree reactions were various physical fitness and psychomotor tests, tests of intelligence and personality, pre-shelter questionnaires, post-shelter questionnaires and in-shelter diaries.

### I. Shelteree Testing

#### A. Physical Fitness and Psychomotor Test Battery

To evaluate the effects of shelter confinement on health, several pre-shelter measures of physical fitness were implemented in ES I-IV (see Tables 92 and 93). The physical fitness battery for ES I included a measure of weight, cardiovascular condition, and a modification of the Rogers Strength Test including lung capacity, and strength of right and left grip. For ES II, back lift, leg lift, push-ups, and pull-ups portions of the Rogers Strength Test were added. The strength index is the gross score obtained by adding these seven items, after pull-ups and push-ups have been combined in a formula to provide an arm strength score. Weight was also retained as part of the battery.

The physical fitness battery for ES III and IV was intended to measure not only strength (portions of the Rogers Strength Test were again used), but endurance, and such psychomotor skills as dynamic balance, and gross motor coordination. Endurance was measured by a modification of the Harvard Step Test in which a subject is required to step up on a platform at the rate of 25 steps per minute for a maximum of four minutes, or until he is unable to continue. The platform ranges in height from 14 to 20 inches, depending on the sex and age of the subject.

A modification of the Springfield Beam-Walking Test was introduced in ES III to measure dynamic balance and gross motor coordination. Dynamic balance refers to the postural orientation of the body when an individual is performing a specified motor activity involving relatively large motions of the whole body, which act to disturb the gross orientation of the person. The blindfolded subject walks the length of the beam (10 feet long by 3½ inches wide), turns around and returns to the starting position. The subject's score is a function of both speed and accuracy, the latter in terms of not stepping off the beam.

A similar beam balance test was used in ES IV in which a subject is required to walk a wooden, U-shaped rail in stocking feet. The

Table 92  
Test Instruments Used Before and After  
Shelter Confinement  
(ES I-X)

Experimental Study	Test Instrument		
	Intellectual	Personality	Psychomotor
ES I	Differential Aptitude Test (VR & MA) Digit Symbol Minnesota Paper Form Board	Minnesota Multiphasic Personality Inventory S-O Rorschach	Selected Performance Tests of the Wechsler Intelligence Scales
ES II	School & College Ability Test General Aptitude Test Battery (S, V, A)	Minnesota Multiphasic Personality Inventory S-O Rorschach	Pursuit Rotor Pianagan Aptitude Coordination
ES III	California S-P Mental Maturity	Minnesota Multiphasic Personality Inventory	Pursuit Rotor Stasionometer Keystone Teichmocular Beam Balance
ES IV	California S-P Mental Maturity	California Test of Personality Bell Adjustment Inventory	Pursuit Rotor Stasionometer Beam Balance Mirror Tracing
ES V	California Capacity Questionnaire Henson-Nelson Test of Mental Ability	Modified Minnesota Multiphasic Personality Inventory California Test of Personality	None
ES VI	None	Selected Sub-Scales of the Minnesota Multiphasic Personality Inventory	None
ES VII	None	Pre-Shelter Questionnaire <sup>a</sup>	None
ES VIII	None	Leadership Sub-Scale of the MAPI Orientation Inventory	None
ES IX	None	Leadership Sub-Scale of the MAPI Pre-Shelter Questionnaire	None
ES X	None	Leadership Sub-Scale of the MAPI Pre-Shelter Questionnaire	None

<sup>a</sup> The Pre-Shelter Questionnaire, used in ES VII, was modified to predict emergent leadership, defections, etc.

Table 21  
Psychological Variables Evaluated Before  
and After Shelter Confinement  
(ES I-X)

Experimental Study	Psychological Variable		
	Intellectual	Social & Emotional	Psychomotor
ES I	Verbal Reasoning Numerical Ability Learning Memory Spatial Relationships	Personal and Social Adjustment	Visual Motor Coordination
ES II	Verbal Reasoning Numerical Reasoning Spatial Perception	Personal and Social Adjustment	Visual Motor Coordination
ES III	Verbal Concepts Numerical Reasoning Logical Reasoning Spatial Relationships	Personal and Social Adjustment	Visual Motor Coordination Depth Perception Dynamic Balance
ES IV	Verbal Concepts Numerical Reasoning Logical Reasoning Spatial Relationships	Personal and Social Adjustment	Visual Motor Coordination Dynamic Balance
ES V	Mathematical Reasoning Spatial Orientation Memory	Personal and Social Adjustment	None
ES VI	None	Personal and Social Adjustment	None
ES VII	None	Leadership Ability	None
ES VIII	None	Leadership Ability	None
ES IX	None	Leadership Ability	None
ES X	None	Leadership Ability	None

rail is 1½ inches wide, 3½ inches high, and 18 feet long. The score is determined by the time required to complete the course without error.

Although selected performance tests of the Wechsler Intelligence Scale were used in the pre-shelter processing for ES I, several techniques (some of which have been previously mentioned) were added in ES II-IV to measure psychomotor skills:

Pursuit Rotor (ES II, III, and IV)--a turn table with a small disc on the periphery. The subject attempts to track the moving disc with an electric stylus; his score is determined by the amount of time the stylus is in contact with the target within a given time period.

Coordination Test of the Flanagan Aptitude Classification Test Battery (ES II)--a measure of the ability to coordinate hand and arm movements and to control these movements in a smooth and accurate manner whenever they need correction.

Stasiometer (ES III and IV)--a device developed by J. Stanley Gray, formerly of the University of Georgia to measure operational steadiness and eye-hand coordination. The subject is required to pass a small metal ring over a spiraled copper tube without touching the tube; his score is determined by the speed and accuracy of performance.

Mirror Tracing Test (ES IV)--a six-pointed printed star is placed on a table before an upright mirror. A shield is positioned above the star in such a manner that when the subject faces the mirror he cannot see the star directly, but only in the mirror. The subject then attempts to trace the outline of the star by directing his pencil movements from the mirror image of star, hand, and pencil.

Keystone Telebinocular Test (ES III)--a measure of stereopsis or depth perception which presents to the examinee a series of symbols, such as a star, a square, a cross, a heart, and a ball. The subject is instructed to designate the symbol that stands out in depth from the others in each row. The score is the number of correct responses.

Physical fitness and psychomotor skills as measured by their respective tests exhibited only two significant changes over confinement. First, subjects in all studies in which a weight record was made showed consistent, significant weight losses ( $.001 > P$ ) with the amount of weight loss usually proportional to the length of confinement. Also, the average weight loss for males tended in all studies, including ES IV with children between the ages of seven and twelve, to be greater than the average female weight loss.

The weight was usually regained within two weeks except for some female shelterees of ES III who expressed satisfaction with the loss and were reluctant to regain it. The second physical change produced by shelter life occurred in ES IV; male leg lift strength showed a significant ( $.05 > P$ ) decrease. A similar, though non-significant, decrease in leg as well as back strength for males in ES II was considered to be the major factor associated with a slight decrease in the mean strength index. Since the shelterees in ES I exhibited little willingness to participate to the full extent possible in the strenuous Harvard Step Test, any meaningful interpretation of changes was obscured.

Psychomotor skills suffered no ill effects from confinement.

#### B. Intellectual and Personality Evaluation

It has been hypothesized that subjects confined in fallout shelters as presently stocked and equipped would suffer impaired concentration, reduced attention span, and a general loss of mental acuity. To test this hypothesis several factors were evaluated in ES I-V. These included verbal reasoning, numerical ability, learning, memory, spatial perception, and logical reasoning. The instruments used to measure these variables included the Differential Aptitude Test (DAT), the Digit Symbol and Digit Span Tests of the Wechsler Scales, the School and College Ability Test (SCAT), the General Aptitude Test Battery (GATB), the California Short-Form Test of Mental Maturity, the California Capacity Questionnaire, and the Henmon-Nelson Test of Mental Ability. (See Table 92.)

The psychological test battery for ES I included the Digit Symbol and Digit Span Tests of the Wechsler Scales. Both verbal and numerical sections of the DAT were used. In an effort to detect possible changes in the shelteree's ability to perceive spatial relationships, the Minnesota Paper Form Board was added. The SCAT and sections of the GATB were administered in ES II. The SCAT, a measure of school-learned abilities, includes reading skill and handling of quantitative information. The "verbal" part involves comprehending the "sense" of a sentence and attaching meaning to isolated words. The "quantitative" sections require manipulation of numbers and solving of quantitative problems. The verbal, numerical, and spatial aptitude sections of the GATB were administered to adults.

The California Short-Form Test of Mental Maturity was used for appraising mental capacity in both ES III and IV.

In ES V the California Capacity Questionnaire (CCQ) was administered to adult shelterees. This test is designed to sample major mental factors, *viz.*, perceptual ability, memory, spatial orientation, mathematical reasoning and inference. The Henmon-Nelson Test of Mental Ability, designed to measure aspects of mental

ability important for academic success, was used for the children. A cognitive vigilance task, in terms of signal detection testing during shelter occupancy, indicated no deterioration in speed and accuracy of performance.

Beginning with ES VI, intellectual and psychomotor tests were omitted primarily due to the prohibitive time factor encountered in working with large groups.

In addition to the mental ability tests, the psychological test battery included several social and emotional evaluations. Two personality measures, the Minnesota Multiphasic Personality Inventory (MMPI) and the Structured Objective Rorschach Test (SORT), were used in ES I and II.

The MMPI yields scores on ten clinical scales which cover such generalized symptoms as headaches, nausea, exhaustion, insomnia, depression, and suggestions of general anxiety states, conflicts with family or friends, and lack of personal sensitivity to the reactions of others.

The SORT was designed to provide psychologically meaningful data for the analysis of temperament and personality. This test combines the subtle features of the Rorschach with practical group methodology. The original inkblots and scoring systems are retained.

For personality evaluation the MMPI was used exclusively in ES III. In ES IV the Bell Adjustment Inventory and the California Test of Personality (CTP) were utilized for personality evaluation. Adults in ES V completed the modified MMPI, and children were given the CTP to assess personality characteristics and evaluate personal and social adjustment. An adult sample of seventy-nine shelterees in ES VI completed selected sub-scales of the MMPI. No personality evaluation, as such, was made in ES VII.

In ES VIII all shelterees fifteen years of age and older were given the Leadership Sub-Scale of the MMPI, used as an experimental predictor of later emergent leadership patterns. The Orientation Inventory was also used to detect leadership patterns in the group. The Leadership Sub-Scale of the MMPI was again administered to all persons fourteen years of age and older in ES IX and X.

There was no indication, from shelteree scores on the tests of mental ability administered in ES I-V, of depreciation of intellectual functioning. Scores remained relatively stable on all measures except for ES I where, with one exception, mean scores on each measure increased from pre- to post-testing for males and females. The increases might have been due to practice effect although alternate forms, when possible, were employed to preclude it. Data from ES II demonstrated that ability to perform mental



tasks with speed and accuracy was not adversely affected by shelter confinement. Subjects, after two weeks in the shelter, were able to perform numerical operations and solve mathematical problems as well as they did prior to shelter entry. The psychological testing data indicated neither impaired concentration nor weakened attention span on the part of the shelterees.

In ES II, scores on the General Aptitude Test Battery ranged from 75 to 116 with a median of 102. Three illiterate adults tested with the Wechsler Adult Intelligence Scale had full scale I.Q.s of 89, 97 and 99. The children in ES IV tested on the California Short-Form Test of Mental Maturity earned scores which ranged from 68 to 137 with a median of 100. The median intelligence quotient of the thirty shelterees who participated in ES V was 95 with a range from 76 to 132.

An analysis of the Minnesota Multiphasic Personality Inventory data showed scores which were well within the normal range and which, in general, were not affected by shelter stresses. The only significant changes in personality occurred in ES I where the scores of male subjects differed from pre- to post-shelter testing on two of the sub-scales. The changes indicated that male shelterees developed mild symptoms of depression, excessive worry, lack of self-confidence and difficulty in concentration while in the shelter. Further, one of the MMPI scales characterized the ES I group as possessing a general disregard for social customs and mores. A non-significant change in the personality of the ES II shelterees from pre- to post-shelter testing was reflected in the MMPI as well as the Structured Objective Rorschach Test. Male pre-test scores indicated lack of deep emotional response while the females, as a group, were rather socially introverted. Post-test results showed a reduction in the capacity for abstraction and an increase in the facility for dealing with concrete detail. Results obtained from scores on the Bell Adjustment Inventory and the California Test of Personality corresponded to those of the MMPI and SORT in showing that no consistent significant effect on personality was produced by confinement.

The results from the Minnesota Multiphasic Personality Inventory Leadership Sub-Scale administered in ES VIII, IX and X showed that, generally, permanent staff members scored higher than the general shelter population. Of the eight members of the permanent staff tested in ES VIII, 62% fell into the top 25% of the shelterees tested. Results of ES IX and X showed the permanent staff members to score significantly higher than the remaining shelterees. Only in ES X, however, did the permanent staff differ significantly from the temporary staff. The results indicated that the selection procedure recommended in the Shelter Handbook and employed by the temporary staff provided for the choosing of those better qualified as leaders.

## II. Shelteree Reactions

### A. Pre-Shelter Questionnaire

Common to each of the experimental studies was a Pre-Shelter Questionnaire, modified from study to study. The orientation of the questionnaire involved all or a portion of the following objectives for each study: (1) to gain insight into the subjects' motivation for participation in the studies, (2) to establish sources of their prior acquaintance with, and knowledge of the research, (3) to ascertain the participants' preparedness for survival, and (4) to understand what they anticipated to be discomforts of confinement. The questionnaires were administered to the subjects toward the end of the pre-shelter testing program.

In ES VI the Pre-Shelter Questionnaire was given only to a sample of one hundred and thirteen shelterees, with one hundred and two persons actually completing it. A similar questionnaire in two forms (for single and married persons) was distributed in ES VII to all shelterees fourteen years of age and above to probe for possible predictors of emergent leadership, defections, etc.

Both an Orientation Inventory to detect leadership patterns in the group and two forms of the Pre-Shelter Questionnaire (for married and single persons) to obtain socioeconomic data were administered in ES VIII to shelterees fifteen years of age and older.



In the section on anticipated discomforts included in the Pre-Shelter Questionnaire for ES I-VI, shelterees yielded the opinion that uncomfortable temperature would be a major discomfort. Lack of bathing facilities and fresh air, sleeping conditions, odors, and food were also classified by at least one-third of the total number of shelterees in these six studies as factors which could lead to discomfort (see Table 94). Though the shelterees were given an opportunity to enter other conditions not mentioned which

Table 94  
Anticipated Shelter Discomforts Indicated by One-Third  
or More of the Total Shelter Population  
(ES I-VI)

Anticipated Discomfort	Frequency of Selection						Total Frequency (N=250)
	ES I (N=30)	ES II (N=30)	ES III (N=30)	ES IV (N=28)	ES V (N=30)	ES VI (N=102)	
Uncomfortable temperature	11	5	10	6	12	80	124
Lack of bathing facilities	14	12	15	8	18	54	121
Lack of fresh air	8	6	10	15	11	65	115
Sleeping conditions	15	17	15	10	10	37	104
Odors	7	11	12	10	14	47	101
Food	11	9	11	4	7	48	90

could cause discomfort, responses were sparse. When subjects in ES I were asked to list what they believed would be the most uncomfortable thing for them during the study, the second most frequent category was coffee and/or cigarette deprivation.

#### B. Post-Shelter Questionnaire

Just prior to release, shelterees in each study were presented with a Post-Shelter Questionnaire on which to record their reactions to the various aspects of shelter life. Although the essential design of the questionnaire was maintained throughout the experiments, modifications appeared from one study to another with later forms being more condensed. The most lengthy questionnaire was employed in ES I and II, wherein the likes and dislikes engendered by confinement, immediate causal factors, the overall perceived difficulty of shelter life, and the sociometric patterns of shelterees were examined. Subsequent questionnaires retained the survey of shelter discomforts and difficulty of confinement but omitted coverage of the pleasurable aspects of shelter living. In addition to being used in ES I and II, sociometric ratings were requested in ES III-V. The questionnaire employed in ES III and IV provided open-ended questions on the evaluation of shelter supplies, while more of an opportunity to comment about shelter organization was provided in ES IX and X.

Upon analysis of the Post-Shelter Questionnaire for all studies, six factors which one-third or more of the shelterees designated as major sources of in-shelter discomfort were observed. These six factors were lack of bathing facilities, chemical toilets, lack of space, sleeping conditions, uncomfortable temperatures, and odors (Table 95). Major conditions which caused shelteree discomfort and the reasons most often given as to why they produced such discomfort are given in Table 96.

Positive aspects of confinement were solicited from shelterees in ES I and ES II. Responses centered around learning survival measures, being of service to the nation, and receiving remuneration for participation (see Table 97). Such reactions were the result of serving in an experiment rather than positive responses to the shelter and shelter life.

Shelteree estimates of the amount of additional time that they could spend inside the shelter ranged from a mean low of 1.9 days in ES I to a mean high of 20.9 days in ES III (see Table 98). Shelterees in the one- to two-week studies gave greater estimates of continued endurance than did shelterees in studies of shorter length. In all studies except ES V, the male mean estimate of tolerance for additional confinement was greater than the female. Table 99 indicates responses, by study, to the following questions: "Would you have volunteered to stay in the shelter if you had known what it

Table 95

Actual Shelter Discomforts Experienced by One-Third  
or More of the Shelter Population  
(ES I-X)

Actual Discomfort	Frequency of Selection										Total Frequency (N=1,010)
	ES I (N=22)	ES II (N=25)	ES III (N=28)	ES IV (N=17)	ES V (N=22)	ES VI (N=171)	ES VII (N=202)	ES VIII (N=175)	ES IX (N=94)	ES X (N=254)	
Lack of bathing facilities	15	21	18	6	15	70	158	107	44	157	611
Chemical toilets	13	18	14	10	5	80	149	96	27	135	547
Lack of space	19	16	11	7	5	43	130	95	38	111	475
Sleeping conditions	22	18	16	9	10	84	84	37	62	132	474
Uncomfortable temperature	16	18	14	6	8	60	96	102	32	99	451
Odors	12	20	15	8	3	26	104	53	22	111	374

Table 96

Nature of Shelter Discomforts  
(ES I-X)

Discomfort	Factors Generally Perceived as Causing Discomfort
Bathing facilities	Not being able to bathe Wearing the same clothes daily Not being able to wash hands Not being able to wash face
Chemical toilet	Unpleasant odor Feeling of uncleanness Too many people for one toilet
Space	Too many people and not enough room Inequitable space distribution
Sleeping conditions	Hardness of floor Closeness of other people No pillow No blanket
Temperature	Too warm Too cool
Odors	Chemical toilet Personal body odor Body odor of others

Table 97

Positive Aspects of Confinement  
Indicated by Shelterees  
(ES I and II)

Positive Aspect	Frequency of Selection		Total Frequency (N=47)
	ES I (N=22)	ES II (N=25)	
Learning how I got along in this type of situation	22	19	41
Learning about fallout protection	19	21	40
Being paid for staying in the shelter	19	21	40
Making a contribution to my country	16	22	38
Learning how to protect myself and others	17	20	37
Making friendships in the shelter	17	19	36
Trying out a new experience	15	17	32
Helping the university do research	10	20	30
Finding out how other people get along in shelters	12	16	28
Taking the psychological tests	4	5	9
Having the chance to get away from other things for a while	2	6	8
Having a good rest	--	3	3

Table 98

Shelteree Estimates of Tolerance  
for Continued Confinement  
(ES I-X)

Experimental Study	Confinement Duration	Mean Estimate of Additional Days in Shelter*		
		Male	Female	Total
ES I	Four days	2.7 (N=11)	1.1 (N=11)	1.9 (N=22)
ES II	Two weeks	16.1 (N=13)	10.0 (N=10)	14.6 (N=23)
ES III	Two weeks	33.1 (N=15)	7.9 (N=14)	20.9 (N=29)
ES IV	One week	5.0 (N=10)	1.4 (N=7)	3.5 (N=17)
ES V	Two weeks	11.0 (N=12)	18.5 (N=9)	13.6 (N=21)
ES VI	Two days	13.3 (N=80)	7.2 (N=39)	10.1 (N=169)
ES VII	One week	8.1 (N=93)	3.7 (N=105)	5.8 (N=198)
ES VIII	Two days	12.3 (N=75)	4.6 (N=92)	8.0 (N=167)
ES IX	Two days	6.2 (N=44)	5.5 (N=46)	5.8 (N=90)
ES X	Two days	9.3 (N=99)	5.7 (N=149)	7.4 (N=248)

\*Estimates, in terms of percentages, for "0" days' tolerance for extended confinement were 8%, 39%, 19%, 20%, and 27% for ES VI, VII, VIII, IX, and X respectively.



Table 99  
Shelteree Evaluation of Shelter Adjustment  
(ES 1-X)

Question	Experimental Study	Male		Response Female		Total Response	
		Yes	No	Yes	No	Yes	No
Would you have volunteered to stay in the shelter if you had known what it would be like?	ES I	8	3	6	5	14	8
	ES II	11	2	11	1	22	3
	ES III	12	3	13	1	25	4
	ES IV	10	--	7	--	17	--
	ES V	11	1	10	--	21	1
	ES VI	65	15	69	22	134	37
	ES VII	72	19	88	23	160	42
	ES VIII	64	12	80	19	144	31
	ES IX	42	3	40	6	82	9
	ES X	79	18	135	21	214	39
Total		374	76	459	98	833	174
		(83.1%)	(16.9%)	(82.4%)	(17.6%)	(82.7%)	(17.3%)
Do you think you would volunteer to stay in this shelter again sometime?	ES I	6	3	1	9	7	12
	ES II	9	3	6	5	15	8
	ES III	10	5	13	1	23	6
	ES IV	9	1	6	1	15	2
	ES V	11	1	8	2	19	3
	ES VI	60	20	60	31	120	51
	ES VII	70	21	74	37	144	58
	ES VIII	57	19	72	27	129	46
	ES IX	40	5	40	6	80	11
	ES X	75	21	119	38	194	59
Total		347	99	399	157	746	256
		(77.8%)	(22.2%)	(71.8%)	(28.2%)	(74.4%)	(25.6%)

would be like?" and "Do you think you would volunteer to stay in this shelter again sometime?"



Shelteree opinion regarding shelter organization and management for ES IX and X varied, not surprisingly, as a function of the different experimental designs employed. Subjects in the 504-person ES X rated the shelter as initially less well organized than did those subjects in the 160-person ES IX. Results from both experiments showed that immediately prior to release shelteree opinion concerning organization was less negative than it had been following entrance. Approximately three-fourths of the subjects in both studies who completed the item of the Post-Shelter Questionnaire dealing with organization and management of the shelter had no complaints.



#### C. Shelter Diaries

Unstructured shelter diaries were presented to shelterees in all ten experimental studies to obtain random, subjective opinions of shelter life. Diaries, as a rule, were administered twice daily. Subjects were instructed to record anything they experienced, thought about or felt during that time. A modified diary form, appropriate to children of grade school age and consisting of general likes and dislikes about confinement, was used in ES IV. In ES VII the

standard unstructured diary was employed jointly with a structured diary on which shelterees rated varying phases of shelter life on a five-point scale. While the structured form permitted a better measure of the subjective intensity of the events experienced, it limited the shelterees to a number of personal experiences.

The diaries were scored under different systems having as their common basis the attempt to classify diary comments into pre-selected categories. Diaries administered during ES I, II, III and IV were interpreted from "like" versus "dislike" categories, wherein "like" included statements with a positive orientation toward shelter environment, and "dislike" included negative ones. ES V diaries were summed in a less quantitative manner to produce a day-by-day written picture of shelter life. For ES VI-X diary comments were classified into "positive" and "negative" categories.

Diary data in many respects duplicated the information obtained by the Post-Shelter Questionnaire. Complaints were concerned most often with space, toilet facilities, food, sleeping, tiredness and the in-shelter temperature. Further, the negative comments tended to be more frequent than the positive and often of a more specific nature. Positive statements most often concerned general uncategorizable comments, or comments concerning other shelterees and in-shelter activities. See Tables 100 and 101 for positive and negative comments made in ES VI-X.

At times, a sharp decrease of negative statements was noted just before exit from the shelter. In ES IX and X, in addition to the negative pre-release decrease, the amount of positive statements showed an increase prior to exit.

An actual nuclear attack would create additional physical and psychological stresses which would probably summate with those discovered in simulated studies to create greater problems of shelter adjustment. To ease the burden of shelter adjustment, an attempt should be made to inform and train the population more adequately in regard to what shelter life will probably be like.

### III. Conclusions

#### A. Shelteree Testing

1. With regard to physical fitness testing, no deleterious effects were observed in physical fitness, psychomotor performance, visual motor coordination, depth perception, or dynamic balance. Other than a weight loss, usually recovered within two weeks, shelterees emerged in good physical condition on completion of confinement.

Table 100  
Positive Shelter Diary Comments  
(ES VI-X)

Category	Percent of Positive Comments <sup>a</sup>				
	ES VI	ES VII	ES VIII	ES IX	ES X
Generally positive	13.1	39.7	33.7	29.5	29.7
People	9.4	14.0	13.5	14.0	15.7
Sleeping	13.8	--	--	6.3	6.4
Recreation and/or exercise	7.2	--	12.3	--	--
Physical feeling	5.0	--	--	11.6	--
Things better	--	5.8	--	5.0	5.6
Food	9.9	6.1	--	--	--
Experience gained from shelter stay	--	--	--	--	12.6
Carbohydrate supplement	11.7	--	--	--	--
Organization	9.7	--	--	--	--
Religious activities	--	--	--	7.2	--
Water quality	5.9	--	--	--	--
Cooperation of others	--	--	5.2	--	--
Staff	--	--	5.2	--	--
Total Scorable Comments	556	700	326	363	240

<sup>a</sup>Only percentages of 5 or above are included. Percentage of positive comments per category are computed on the total number of positive comments per study.

Table 101  
Negative Shelter Diary Comments  
(ES VI-X)

Category	Percent of Negative Comments <sup>a</sup>				
	ES VI	ES VII	ES VIII	ES IX	ES X
Space lack	7.2	10.9	23.8	23.0	21.5
Sleeping	16.2	6.4	--	7.1	5.1
Health	8.7	--	--	8.8	8.9
Crackers	16.4	8.9	--	--	--
Too hot	--	--	5.9	--	10.1
Water	7.0	7.6	--	--	--
Food	5.3	9.1	--	--	--
Fatigue	--	--	--	13.0	--
Space management	--	--	--	6.7	--
Organization	--	--	6.5	--	--
Toilet	--	--	5.6	--	--
Noise	--	5.2	--	--	--
Generally negative	--	--	--	--	5.1
Total Scorable Comments	970	1293	323	239	237

<sup>a</sup>Only percentages of 5 or above are included. Percentage of negative comments per category are computed on the total number of negative comments per study.

2. With regard to personality testing, no attenuation of mental abilities, attention span, concentration, or mental efficiency was indicated in test results. Neither were there any adverse effects on personal and social adjustment scores as a result of shelter confinement.
3. Permanent shelter staff members scored consistently higher than the remaining shelter population on a predictive leadership scale.
4. In general, healthy men, women, and children can endure two weeks' isolated shelter confinement under conditions of severe austerity without suffering deleterious physiological or psychological effects.

#### B. Shelteree Reactions

##### 1. Post-Shelter Questionnaire

- a. Primary discomforts cited by at least one-third of all shelter study participants were lack of bathing facilities, chemical toilets, lack of space, sleeping conditions, uncomfortable temperature, and odors.
- b. Shelterees participating in the longer confinement studies gave longer estimates of endurance for extended stay than those shelterees participating in studies of shorter duration. Estimates given by men exceeded those of the women and children.
- c. Over all the studies, mean estimates of endurance for extended stay ranged from two to twenty-one days.
- d. When asked if they would have volunteered for an occupancy test had they known what it would be like, 83% of all responding shelterees answered in the affirmative, and 74% stated they would volunteer for another study.

##### 2. Shelter Diaries

- a. Occupants of the two-week studies reached their lowest morale level at the midpoint of the occupancy period, i.e., at the end of the first week.
- b. When depression does occur, it is highest in the morning hours, and diminishes toward the end of the day.
- c. Diary data in many respects duplicated the information obtained by the Post-Shelter Questionnaire.

## Chapter 15 - Environmental Variables

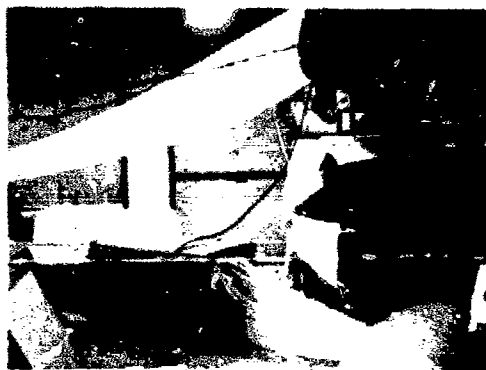
### I. Temperature and Ventilation

In ES I-V, although the experimental design indicated optimal temperature and humidity conditions, equipment variability at times introduced uncomfortably warm and cold temperatures. Shelterees were permitted various changes in air temperature as well as changes in ventilation. Effective Temperature (ET) selected by shelterees in the five studies ranged from 69°F to 83°F with a mean approximately 76°F. Two ventilation conditions used were 15 and 40 cfm/person. During ES I, only the 15 cfm/person rate was used.

In ES VI, General American Transportation Corporation conducted ventilation tests. Temperature and humidity were again optimal. (For a detailed evaluation see Behls, H. F., et al., 1964).

In ES VII and VIII, the Temperature-Humidity-Index (THI) was calculated. For ES VII, the range of THI was 73.6°F to 77.2°F with a mean of 75.7°F. For ES VIII the range of THI was 78.1°F to 79.0°F with a mean of 78.4°F. Ventilation in the above ground shelter was natural with additional circulation provided by intake window fans in the shelter and attic-type exhaust fans outside the shelter area.

The same arrangement of fans was used in ES IX. In ES X the PVK was also used, with the shelter exhaust fans used very limitedly. In ES IX the THI in the shelter ranged from 67.6°F to 71.8°F with a mean of 69.8°F. In ES X, THI ranged from 68.2°F to 81.8°F with a mean of 75.4°F (see Table 102).



### II. Space

In ES I, II, III, and V, 8 square feet was allowed for each shelteree, with an additional cubic foot allowance per person for storage. In each of these four studies the shelter population was composed of adults and children.

Table 102

Effective Temperature or  
Temperature-Humidity Index Values °F  
(ES I-X)

Experimental Study	Mean ET	Mean THI	Range of Daily Mean ET	Range of Daily Mean THI
ES I	78°		74 - 81°	
ES II	77°		69 - 83°	
ES III	74°		70 - 79°	
ES IV	75°		73 - 76°	
ES V	72°		66 - 76°	
ES VI*				
ES VII		75.7°		73.6 - 77.2°
ES VIII		78.4°		78.1 - 79.0°
ES IX		69.8°		67.6 - 71.0°
ES X		75.4°		68.2 - 81.8°

\*Ventilation tests conducted by the General American Transportation Corporation.



Experimental Study IV was composed of children, aged seven to twelve years, and two adults. In this study the space allotment was 6 square feet per person, plus 1 cubic foot per person for storage.

In ES VI, with a shelter population of three hundred persons aged three to sixty-six years, the space allotment was 10 square feet per person. No additional space was added for storage.

Experimental Study VII, with a shelter population of three hundred and seven persons aged two to sixty-seven years, and Experimental Study VIII, with a shelter population of three hundred and twenty-one persons aged one to sixty-seven years, provided a space allotment of 10 square feet per person. No additional space was added for storage.



Experimental Study IX involved a shelter population of one hundred and sixty persons aged one to sixty-five, for whom the space allotment was 6-7 square feet per person. No additional space was added for storage.

In ES X, with a shelter population of five hundred and four shelterees aged nine months to seventy years, the space allotment was 8 square feet per person, including space for storage.

In all experimental studies the space allotments were accompanied by intended optimal conditions of effective temperature and ventilation. Even under these conditions, space was a discomfort.

In ES X the reduced space allotment created organizational problems during shelter entry, as discussed in the presentation of ES X results elsewhere in this report.

### III. Noise

As would be expected, noise has consistently shown a high correlation with activity. However, not until ES VI, the first large study, did "noise" appear on the Post-Shelter Questionnaire as a high discomfort factor; it was mentioned by 24.6% of the shelterees. In ES VII

noise was listed as a discomfort by 54% of the shelterees, and in ES VIII by 30%. In ES IX the percentage was 25.5% and in ES X it was 30.7%.

In ES IX and X, noise level readings were recorded on a General Radio Company Type 1565-A sound level meter. The overall mean noise level for daylight hours in ES IX was 72.1 decibels with a minimum reading of 64 decibels and a maximum reading of 78.8 decibels. In ES X the range was 64 decibels to 85 decibels with an overall mean of 73.2 decibels. Since the decibel scale is logarithmic in nature, an increase of ten decibels signifies a tenfold increase in noise level, not merely the addition of ten "units of noise." Thus in ES X the noise level varied a hundredfold and averaged ten times the loudness of normal conversation. See Table 103 for a relative comparison of several familiar noise levels with those of ES IX and ES X.

#### IV. Lighting

In ES I-V, optimal lighting was provided for the entire duration of each study (Table 104). The control of this lighting was left to the discretion of the shelterees, although previously the Shelter Manager had assumed control of lighting.

In ES VI, because of filming procedures, a high lighting level was maintained during the daytime. Lighting level was not reported a discomfort on the Post-Shelter Questionnaire.

In ES VII and VIII the main lighting was provided by sixteen 170-watt fluorescent ceiling lights. Camera lighting was provided by thirty-four 200-watt incandescent bulbs, used only during filming.

In ES IX the main lighting was provided by natural light, and four 170-watt fluorescent ceiling lights. Camera lighting was provided by ten 200-watt incandescent bulbs, again for use only during filming. In ES X the main lighting was natural light plus that provided by sixteen 170-watt fluorescent ceiling lights, and camera lighting by thirty-seven 200-watt incandescent bulbs. During ES IX and X, illumination readings in the shelter area were recorded on a Weston Model 709 foot-lambert meter. For ES IX, the overall mean illumination was 4.9 foot-lamberts, with a maximum of 13.5 foot-lamberts, and a minimum of 1.7 foot-lamberts. During ES X, the overall mean illumination was 5.9 foot-lamberts, with a maximum of 46.5 foot-lamberts, and a minimum of 0.0 foot-lamberts.

Table 103

## Relative Noise Levels of Familiar Sounds

Noise Level in Decibels	Sound Associated with Decibel Level
130.0	Painful sound
120.0	Thunder
110.0	Auto horn
100.0	Subway train
90.0	Loud parts of orchestral music
80.0	Noisy auto
<u>73.2</u>	<u>Mean daily noise level, ES X</u>
<u>72.1</u>	<u>Mean daily noise level, ES IX</u>
60.0	Normal conversation
40.0	Quiet office
20.0	Softest parts of orchestral music
10.0	Low whisper
0.0	Threshold

Table 104  
Lighting Conditions in Occupancy Studies  
(ES I-X)

Experimental Study	Lighting Condition
ES I	Optimal
ES II	Optimal
ES III	Optimal
ES IV	Optimal
ES V	Optimal
ES VI	High lighting level maintained during daylight hours for filming
ES VII	Main lighting - 16 170-watt fluorescent lights Camera lighting (on only during filming) - 34 200-watt incandescent bulbs
ES VIII	Same as in ES VII
ES IX	Main lighting - natural plus 4 170-watt fluorescent lights Camera lighting (on only during filming) - 10 200-watt incandescent bulbs Overall mean illumination: 4.9 foot-lamberts
ES X	Main lighting - natural plus 16 170-watt fluorescent lights Camera lighting - 37 200-watt incandescent bulbs Overall mean illumination: 5.9 foot-lamberts

## V. Conclusions

### A. Temperature and Ventilation

Mean daily effective temperatures and temperature-humidity-indices ranged from 66°F to 83°F, creating uncomfortable but tolerable shelter conditions.

### B. Space

1. Eight square feet per person, exclusive of storage, although uncomfortable, would appear to be adequate for the 300-person community fallout shelter. This conclusion is restricted to optimal temperature and adequate ventilation conditions. For shelters of 500 persons or more, the OCD specified 10 sq. ft./person appears to be indicated to avoid entry organizational problems associated with reduced space allotment.
2. Effective space utilization is an important problem of shelter habitation.

### C. Noise

It was found that in small shelters the shelterees have a greater tolerance for noise, but that in larger shelters this tolerance decreases.

## Chapter 16 - Shelter Supplies

### I. Water

For effects of water dispensing procedures on public health, see the discussion on sanitation elsewhere in this report. Water for bathing was not allotted and was not used for such on a shelter-wide basis except in ES III. In this study the Shelter Manager permitted a sponge bath at the mid-point of confinement, since the shelterees consumed less than the allotted amount of water for drinking purposes. Lack of water for washing was a primary complaint in all studies.

The Office of Civil Defense has established a method of filling water drums for fallout shelters which, when followed, provides a source of sanitary drinking water for emergencies. A survey of shelters in the Clarke County Area of Georgia revealed that not all water drums in shelters were filled; a similar unpreparedness probably exists throughout the nation. On the assumption of such unpreparedness, tests were conducted to determine if water containers could be filled between the time of a possible emergency alert and the arrival of radioactive fallout. Two factors were experimentally evaluated: (1) The speed with which the standard OCD 17 1/2-gallon water container could be filled without inclusion of the plastic liner; (2) The amount of bacterial contamination which water stored without bag liners might acquire. None of the tested drums were provided with liners, since assembly would have required additional time. Also, it is possible that bag liners may not have been stocked and therefore be unavailable in a sudden emergency.

The experimental design included various conditions of sanitation which might exist in such a situation (Table 105). For example, the filling area was not cleaned prior to the filling of the first four drums. Two persons, both familiar with the task, worked together filling the drums. The water hose consisted of a 5' length of 3/4" (inside diameter) rubber hose connected to a standard threaded water faucet on a laundry basin. The filling area was then cleaned with a lye solution and a common cleaning agent, before the remaining drums were filled.

After lids were replaced, the drums were stored for ninety days (December, 1965 through February, 1966) in the unheated, marked, and stocked shelter where they had been filled. The extreme temperatures for this period, as reported by the United States Weather Bureau, were -1.0° F and +71.0° F. The mean temperature was approximately +42.2° F.

Results indicated that the average drum-filling time required by two adult males familiar with the procedure and working at top speed was three minutes and twenty-six seconds. No drums were found to leak during the ninety-day storage test. A subsequent bacterial analysis of the water stored under the various conditions of sanitation indicated the water to be of satisfactory bacterial quality in an emergency situation (Table 106). The analysis was done locally by the Athens-Clarke County Health Center.

Table 105

## Water Drum Sanitation Conditions Tested

Experimental Condition	Drum Number
Filling area unclean Drum clean <sup>a</sup> No additives	1
Filling area unclean Drum dirty <sup>b</sup> 20 Iodine tablets added	2
Filling area unclean Drum dirty <sup>b</sup> No additives	3
Filling area unclean Drum clean <sup>a</sup> 20 Iodine tablets added	4
Filling area clean Tape removed from seam Drum clean <sup>a</sup> No additives	5
Filling area clean Drum clean <sup>a</sup> 2 Teaspoonfuls bleach added	6
Filling area clean Drum dirty <sup>b</sup> 2 Teaspoonfuls bleach added	7

<sup>a</sup> Empty water drums which had been covered with lids while in storage and contained no visible dirt or dust were designated "clean."

<sup>b</sup> Empty water drums which had not been covered with lids while in storage and contained visible dirt or dust were designated "dirty."

Table 106

Bacterial Analysis of Water Stored  
in Drums without Liners

Drum Number	Coliform-group Organisms <sup>a</sup>			MPN/100 ml	SAPC <sup>b</sup>
	5-10	1-1	1-0.1		
1	0	0	0	0	175 <sup>c</sup>
2	0	0	0	0	3480 <sup>c</sup>
3	0	0	0	0	580 <sup>c</sup>
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0

<sup>a</sup> Found when portions of water were inoculated into lactose broth.

<sup>b</sup> Standard Agar Plate Counts.

<sup>c</sup> High, but acceptable in an emergency.



The general conclusion indicated is that in an emergency, water drums can be filled directly without use of the plastic bag assembly, and stocked for shelter use.



## II. Food

In the earlier two-week and one-week studies, three cereal rations were used: the bulgur wheat wafer in ES I and II, Nabisco wheat-flour biscuit in ES III, and the Nebraska wheat-corn-flour cracker in ES IV. All three of these rations were used in ES V in order to obtain a relative preference ranking of the three cereal rations. The distribution of these rations was randomized on a daily basis, e.g., the biscuit one day, the cracker the next day, and the wafer the third day. It was found that the Nabisco biscuit was the most preferred. The bulgur wafer and Nebraska cracker received approximately equal secondary ratings.

In ES IV the carbohydrate supplement was introduced into the heretofore monotonous diet of cereal ration and water, and was maintained through ES X. The supplement was well received even though it sometimes caused a few complaints of mouth soreness after several days' consumption.

A nausea reaction, present in every study, cannot be attributed to the food alone since it is highly probable that a complex of environmental variables involving adjustment to new surroundings may have played a part to a greater or lesser degree.

A complaint leveled at the bulgur wafer when it was used exclusively was that more water was required to reduce thirst. It also tended to produce colonic flatus. In addition, complaints of the Nebraska cracker being burned and broken were made.

In ES VI-X the Nebraska wheat-corn-flour cracker was stocked along with the carbohydrate supplement. In all five studies the allotted ration per person per day was more than the consumed ration per person per day (see Table 107). However, in ES VII-X, shelterees were instructed to bring items they deemed necessary for survival, and many shelterees

Table 107

Average Food and Water Consumption  
(ES I-X)

Experimental Study	N	Length of Study	Age	Food* (cal./person/day)		Water (qt./person/day)	
				Approximate Allotment	Approximate Consumption	Approximate Allotment	Approximate Consumption
ES I	30	4 days	15-50	300	315	1.0	1.3 <sup>b</sup>
ES II	30	2 weeks	9-67	1000	787	2.0	1.4
ES III	30	2 weeks	7-66	900	814	1.5	1.0
ES IV	30	1 week	7-12	900	848	1.5	1.0
ES V	30	2 weeks	7-70	900	808	1.5	1.0
ES VI	300	2 days	3-66	700	514	1.0	1.0
ES VII	307	1 week	2-67	700	776 <sup>c</sup>	1.0	1.2 <sup>c</sup>
ES VIII	321	2 days	1-67	700	655 <sup>c</sup>	1.0	.8 <sup>c</sup>
ES IX	160	2 days	1-65	700	560 <sup>c</sup>	1.0	2.1 <sup>c</sup>
ES X	504	2 days	9 (mos.)-73	700	568 <sup>c</sup>	1.0	1.4 <sup>c</sup>

\*Wafer, biscuit, cracker, carbohydrate supplement.

<sup>b</sup>Remaining rations of defection shelterees were consumed by full-time shelterees.<sup>c</sup>OCD stocked supply consumption. Food and water brought in by shelterees not inventoried.

brought various food items as part of their personal supplies. Consequently, these individuals supplemented the shelter rations with their own personally-supplied adjuncts.

Various aspects of the federally stocked food consistently emerged as discomfort factors. Although the daily allotment appeared adequate (based on ES VI in which only OCD rations were allowed), except in the case of very small children, other factors such as lack of variety or taste, undesirable taste, or hardness and dryness, were causes of discomfort. Food has even been blamed as a contributor to defections. A problem arising with children centers around the fact that they often refused to eat the cereal rations as such. Unless the shelterees were allowed to bring in food which the children preferred, the latter were prone to eat the carbohydrate supplement primarily, creating a situation which in some cases eventually led to nausea. In ES VI a procedure was initiated whereby a cereal mash was made using the cracker and water flavored with the carbohydrate supplement. In this form the cereal ration seemed to be more acceptable to children.

In ES VII-X food was one of the items shelterees wished they had brought with them or felt had been most helpful.



### III. Sanitation Kit

Primary complaints in the first three experimental studies regarding the ineffectiveness of the deodorant qualities of the commode chemical, Weladyne-F53, led to the initiation of a series of commode chemical tests in ES III and continued in ES IV (see Table 108). Since urine collection in ES II depleted the normal liquid contents of the commode and may have compounded the odor problem, the first commode test in ES III was Weladyne as prescribed. When the mid-study urine collection was taken, water was deposited in the commode. Shelterees reactions indicated that odor was a problem in the first four tests but not in Test 5, in which sodium nitrate was added to the Weladyne. This test proved satisfactory in removing odor as a complaint.

Table 108  
Commode Chemical Tests  
(ES I-X)

Experimental Study	Commode Chemical	Commode Volume	Amount of Water
ES I	Weladyne-F53 as prescribed	--	--
ES II	Weladyne-F53 as prescribed	--	--
ES III			
1	Weladyne-F53 as prescribed	--	--
2	Weladyne-F53 as prescribed	--	to cover contents
3	2 $\frac{1}{2}$ Oz. Weladyne-F53 2 $\frac{1}{2}$ Oz. Weladyne-F53 2 $\frac{1}{2}$ Oz. Weladyne-F53	0 1 1	1 Qt. 0 0
4	Same as ES III-1, with toilet tissue placed in separate container		
5	2 $\frac{1}{2}$ Oz. Weladyne-F53; $\frac{1}{2}$ Oz. Sod. Nitrate 2 $\frac{1}{2}$ Oz. Weladyne-F53; $\frac{1}{2}$ Oz. Sod. Nitrate 2 $\frac{1}{2}$ Oz. Weladyne-F53; $\frac{1}{2}$ Oz. Sod. Nitrate	0 1 1	1 Qt. 0 0
ES IV			
1	2 Oz. Boric Acid; 1 Oz. Sod. Perborate; 1 Pt. Mineral Oil 1 Oz. Boric Acid; $\frac{1}{2}$ Oz. Sod. Perborate; 0 Pt. Mineral Oil 1 Oz. Boric Acid; $\frac{1}{2}$ Oz. Sod. Perborate; $\frac{1}{2}$ Pt. Mineral Oil	0 $\frac{1}{2}$ $\frac{1}{2}$	1 Qt. 0 0
2	1 Oz. Cupric Sulphate; 4 Oz. Sod. Perborate; $\frac{1}{2}$ Pt. Mineral Oil $\frac{1}{2}$ Oz. Cupric Sulphate; 3 Oz. Sod. Perborate; $\frac{1}{2}$ Pt. Mineral Oil $\frac{1}{2}$ Oz. Cupric Sulphate; 3 Oz. Sod. Perborate; $\frac{1}{2}$ Pt. Mineral oil	0 $\frac{1}{2}$ $\frac{1}{2}$	2 Qt. 0 0
ES V			
1	Weladyne-F53 as prescribed	--	--
2	2 Oz. Phenol 1 Oz. Phenol 1 Oz. Phenol	0 1 1	2 Qt. -- --
ES VI	Weladyne-F53 as prescribed	--	--
ES VII	Cupric sulfate pentahydrate and sodium bisulfate at concentrations of 4,000 and 8,000 ppm, respectively	--	--
ES VIII	Commode chemical--granular form as prescribed	--	--
ES IX	Commode chemical--granular form as prescribed	--	--
ES X			
1	Cupric sulfate pentahydrate and sodium bisulfate Cupric sulfate pentahydrate and sodium bisulfate Cupric sulfate pentahydrate and sodium bisulfate	0 $\frac{1}{2}$ $\frac{1}{2}$	1 Qt. -- --
2	Alkyl dimethylbenzyl ammonium chlorides and Urea (Timsen)		Added prior to initial commode use

Commode odor was a primary complaint in ES IV, the one-week study with children. However, staff observers thought it was noticeably less than that experienced with Weladyne. The two adult shelterees did not consider commode odor a serious complaint.

Four commodes were used during ES V. The first commode test (Weladyne as prescribed) was terminated due to bag liner leakage when the commode was about three-fourths full. The second test, using dry phenol and water, was successful and was continued throughout the study.

In ES VI, twelve Weladyne-F53 chemical commodes were utilized. OCD instructions concerning the amount and method of use were followed. Commodes emerged as a major complaint during this study, primarily because of the odor. It was necessary to replace commodes used by females more quickly than those used by males, possibly because more bulk such as toilet tissue and sanitary pads went into the toilets serving the females.

In ES VII, the male and female chemical commode areas on the first floor of the shelter were utilized during the temporary phase of the study. Upon the completion of this phase the United States Army Engineer Research Development Laboratory (USAERDL) sanitary vaults were made operational in three of the four commode areas. During the permanent phase of the study, the commode areas on the second floor were also used. The female commode area contained a sanitary vault while a chemical commode was used in the male commode area throughout the study (see 1965 Final Report).

Although there were many complaints regarding unpleasant commode odors, the chief complaints seemed to be directed toward the USAERDL sanitary vaults. It should be noted, however, that the sanitary vaults were in all of the commode areas except one (upstairs male) for most of the study, and therefore, they were more likely to be the target of odor complaints.

Chemical commodes were again utilized in ES VIII, and as in ES VII, the Post-Shelter Questionnaire revealed that toilet odors ranked among the top discomforts. In ES VII, there were 74% negative comments on the toilets, while in ES VIII negative comments reached 55%. The reason for the decline in negative comments in ES VIII may have been due to the fact that it was only a forty-eight-hour study, while ES VII was a one-week study, and odors would tend to become more intense over the longer time period. Consequent to odor was the general attitude that the toilet was unclean (provoked in part by males not removing the seat when urinating), the smell of effluvium, and a tendency for the toilet contents to spray in the early studies.

Other complaints cited in ES VII included a lack of privacy (reported by 45% of the group) and an inadequate number of toilets for the size of the shelter group (38% of the shelterees).

In Experimental Studies IX and X, fewer complaints about odor were noted, relative to past studies. However, in ES IX, leakage from the polyethylene liners did occur. This was primarily due to the fact that the Director of Supply and Maintenance separated the double-liner polyethylene bag to make two single liner bags, lessening the relative strength of the bag assembly. Leakage problems were eliminated in ES X by using metal water drums. The odor problem was also alleviated by use of the Packaged Ventilation Kit.

The chemical commodes were found to be too high for comfortable use by women and children. In ES VI, biscuit tins were used as steps for the children. The toilet seat was also somewhat uncomfortable due to its shape and insubstantial pliability.

Five leaks, all in fiberboard drums, and due to rupturing of the plastic liners, were detected. Leakage occurred once in ES V, twice in ES VI, once in ES VIII, and once in ES IX. At times, plastic bag liners were used for purposes other than their intended use, viz., receptacles for trash or dirty clothes and covering for food tins in ES VII. Use of empty metal water drums helped eliminate leakage problems in ES X and this procedure should be continued.

Drinking cups, toilet paper, sanitary pads, and hand cleaner were excessively used items (see Table 109) except when strict control measures were taken. Disappearance of some of the toilet paper, for instance, may be attributable to such instances as using toilet paper to dry the hands after hand cleaner use in ES VI or the use of it in ES VII as "towels" in the commode area after some women took "baths".

Although in ES VII-X shelterees were allowed to use their discretion in bringing anything they thought was necessary for survival, less than ten percent of the shelterees in each study took a supply of sanitary napkins into the shelter with them, and consequently, the stocked supply in these studies was also drawn on heavily. From these observations it could be concluded that these items were used excessively, but another possibility should be considered, viz., that the supply stocked simply was not an adequate ratio for the number of persons involved.

The drinking cups provided in the sanitation kit were often-times cited as being too fragile. However, when cup racks were made from empty cardboard biscuit boxes in ES VI, complaints were reduced. A cup made by Lily was also introduced during this study, and from all indications it seemed to be more durable than the translucent cup. The styro-foam cup, introduced in ES II, has proven especially durable.

The paper cups stocked in the sanitation kit containing the longer siphon hose were used during ES VII and found to be inadequate. By the second day of confinement many of the cups were leaking and by mid-confinement they were a source of overwhelming complaints. When water was left in the cups they tended to weaken, and often the bottoms fell out. The quantity stocked created another complaint. Several shelterees

Table 10<sup>a</sup>  
Excessively Used Sanitation Kit Items  
(ES I-X)

Item	Percent Used									
	ES I (4-day)	ES II (2-week)	ES III (2-week)	ES IV (1-week)	ES V (2-week)	ES VI (weekend)	ES VII (1-week)	ES VIII (weekend)	ES IX (weekend)	ES X (weekend)
Cups	95	- <sup>a</sup>	100	93	100	81	100	83	81	99
Lids	95	- <sup>a</sup>	78	93	100	72	100 <sup>b</sup>	58	26	78
Sanitary napkins	92	100 <sup>c</sup>	53	8	100	9	57	30	24	21
Toilet tissue	50	80	80	70	100	38	70	33	30	30
Hand cleaner	50	- <sup>a</sup>	100	50	50	58	- <sup>d</sup>	56	- <sup>d</sup>	- <sup>d</sup>

<sup>a</sup>Not inventoried.

<sup>b</sup>Additional styrofoam cups sent in at mid-study when original supply was exhausted.

<sup>c</sup>Two additional dozen used after being sent in when original supply was exhausted.

<sup>d</sup>No waterless hand cleaner stocked in this study.

resorted to making triangular paper cups for their water or using empty fruit juice cans when the OCD cup supply was exhausted. Translucent plastic cups were again utilized in ES VIII, but unless handled carefully, frequently split. If shelterees had made cup racks as suggested in the supplement, this problem may not have become so critical, in ES VII particularly. Despite the fragility of the cups, all groups were required to manage with the supply available, except in ES VII when a supply of styrofoam cups was sent into the shelter by the CDR staff at mid-confinement to help alleviate the problem.



The can opener provided in the sanitation kit appeared adequate, but it left jagged edges on the food tins, causing a few isolated complaints of cuts.

Plastic gloves stocked in the sanitation kit are essential for care of the chemical commodes and were adequate when used as directed. In addition they were used by the food distributors in several instances during ES VII.

#### IV. Medical Kit

Medical Kit C, prepared and supplied by the Office of Civil Defense for three hundred occupants and designed to meet their medical needs for periods up to two weeks, was stocked in the three hundred-person studies, ES VI, VII, and VIII. The kit was used by medical teams comprised of a physician and nurse. In Experimental Studies I, II, and V, Medical Kit A (designed for use with a fifty-person group) was utilized. It was also used in ES III and IV but with certain modifications, such as the deletion of certain items or the reduction in quantity. Although the adequacy of the medical kit could not be fully evaluated (since only medically screened shelterees were used and since shelterees were allowed to defect for medical reasons), it appeared to be adequate for the shelter medical problems encountered under the conditions of the occupancy tests.

For an evaluation of the medical kit, see the chapter on medical aspects of shelter confinement.



## V. Radiation Kit

The standard OCD shelter radiation kit has been a stocked item in all occupancy studies. However, the main purpose for stocking the kit through ES VI was instructional use. Evaluating its efficiency in detecting radiation was not a research objective in the first six studies.

In ES VII a program was devised for simulating radef inputs, which could later be expanded and integrated with other EOC program materials.

The results of the EOC program in ES VIII indicated the role of the radiation kit was successfully implemented. For further information see the section on the Emergency Operating Center, elsewhere in this report.

## VI. Sleeping Facilities

Sleeping facilities in ES VI, the first three hundred-person study, were the same as in ES II-V, *i.e.*, shelterees slept on 3/16" corrugated fiberboard pallets. During ES VII-X, however, many shelterees, since they were allowed to bring items deemed necessary for survival, brought bedding. In these studies, articles such as air mattresses and cots, although they provided more comfortable sleeping, created a critical space problem. This problem was continual, since usually no attempt was made to stow the bedding during the day.

ES I shelterees slept four nights on a concrete floor. This circumstance led to complaints of hardness of the floor and body aches, and primarily because of these complaints the fiberboard pallets were introduced in the next study, used through ES VI. Although complaints continued with fiberboard pallets, most shelterees nevertheless endured confinement.

## VII. Shelteree Personal Possessions

The earlier studies, ES I-VI, allowed the shelterees to bring into the shelter minimal personal supplies. Items permitted included toilet articles (combs, brushes, lipstick), time pieces, eye glasses and one pack of cigarettes or tobacco. However, in ES I tobacco was excluded, and in ES III and IV time pieces were not permitted. No food or water supplies, soap, eating or cooking utensils, or bedding materials were allowed to be brought into the shelter by the occupants.

In an experimental assessment of survival items people might bring to shelters, shelterees participating in ES VII-X were permitted to bring extra supplies, including recreational material, clothes, bedding, and radios. In ES VIII-X, food and liquids were allowed to be brought into the shelter. Table 110 presents the percentage of shelterees in each study bringing items which were brought by at least ten percent of the shelterees. Also listed are item frequency ranks for each study,

Table 110

Percentage of Shelterees Bringing Items  
And Frequency Rank of Items Brought  
(ES VII-X)

Item*	ES VII		ES VIII		ES IX		ES X		Mean	Mean
	Percent	Rank	Percent	Rank	Percent	Rank	Percent	Rank	Percent	Rank
Blanket or quilt	35.8	3	45.0	2	55.1	2	72.0	1	52.0	1
Books	52.3	1	44.2	3	48.2	3	49.8	3	48.6	2
Candy	26.1	7	49.4	1	44.8	5	43.0	8	40.8	3
Comb or brush	23.3	10	8.2	4.5	62.5	1	60.3	2	39.6	4
Chewing gum	22.2	11.5	43.1	4	39.4	7.5	43.2	7	37.0	5
Pillow	26.1	6	41.3	5	39.4	7.5	33.6	9	35.1	6
Toothbrush	42.0	2	38.7	6	23.1	14	30.8	11	33.7	7
Pen or pencil	19.9	13.5	36.4	7	45.5	4	28.6	14	32.6	8
Underwear	28.9	4	35.7	8	16.5	26	21.4	24.8	25.6	9
Deodorant	15.3	17	28.3	12	19.7	21.5	29.3	13	23.2	10
Playing cards	27.3	5	29.7	10	4.5	42	26.5	18	22	11
Cosmetics	9.6	28	23.4	15.5	21.7	17	28.2	15	20.7	12
Toothpaste	23.8	9	24.5	14	11.5	38	22.8	24	20.7	13
Air mattress	19.9	13.5	20.5	21	14.2	33	24.9	21	19.8	14
Cigarettes	14.8	18	16.0	27	21.7	17	25.8	19	19.6	15
Shirt or blouse	23.9	8	18.2	23	16.62	25	17.1	31.8	19.0	16
Paper (writing)	15.9	15.5	15.2	29	28.7	13	12.7	42.5	18.1	17
Wet/Dry towellettes	9.0	31	11.2	38	31.9	10	14.3	38	16.6	18
Tissues (facial)	11.9	21.5	21.9	17	10.8	39	18.3	29	15.7	19
Games	10.2	25.5	12.3	34	22.4	15	17.4	31	15.6	20
Radio	15.9	15.5	8.2	45	21.08	19	14.1	39.5	14.8	21
Sheet	10.2	25.5	5.6	48	19.0	24	21.4	27	14.1	22
Pants or slacks	9.0	31	12.6	32	16.3	28	17.6	30	13.9	23

\*Items brought by at least 10% of the total ES VII-X shelterees.

the mean percentages of persons bringing an item, and the mean item ranks for these four studies. The most frequently listed items brought by at least one-third of all shelterees included blanket or quilt, books, candy, comb or brush, chewing gum, pillow, and toothbrush.

The most frequently listed bedding items were blankets or quilts, followed by pillows, air mattresses and sleeping bags.

Underwear was the most frequently listed clothing item, and an extra shirt or blouse and extra pants or slacks were brought in by at least more than 10% of the shelterees in each study.

The most frequently listed recreational item was books. Playing cards, games, pens and pencils, and writing paper were also brought by a large number of shelterees.

#### VIII. Recommended Additional Supplies

Shelterees in each study were asked to list additional supplies that might be stocked in shelters. Generally, these suggestions paralleled the discomfort factors cited on the Post-Shelter Questionnaires. The most frequently suggested additional supplies are shown in Table 111.

Administrative supplies were kept at a minimum in all studies. Pencils and paper were stocked for the use of the management staff and for various in-shelter activities required for experimental purposes. In addition, a shelter handbook was stocked in ES VI-X. Additional supplies suggested as management aids included thumb tacks, masking tape, and a magic marker.

#### IX. Items Shelterees Would Bring for Another Shelter Stay

Shelterees in three of the larger experimental studies were asked to list the items they would bring if they were going to participate in another shelter stay (Table 112). Generally the items listed were very similar to those recommended as additional supplies to be stocked in the shelter.

Items that shelterees would bring for another stay and recommended additional supplies to be stocked generally paralleled the discomfort factors cited on the Post-Shelter Questionnaire.

#### X. Conclusions

##### A. Water

1. Although the quality of water and the amount of water available have been found to constitute shelteree complaint factors,

Table 111

Most Frequently Suggested Additional Supplies  
(ES I-X)

Supplies	ES I	ES II	ES III	ES IV	ES V	ES VI	ES VII <sup>a</sup>	ES VIII <sup>a</sup>	ES IX	ES X <sup>a</sup>
Improved food (variety, taste)	X	X	X	X	X	X	X	--	X	X
Improved sleeping facilities (bunks, beds, bedding)	X	X	X	X	X	X	--	--	X	X
Improved toilet facilities	--	X	X	--	--	X	X	X	--	X
Storage facilities	X	--	--	--	X	X	--	--	X	X
Recreational material	X	X	--	--	X	X	--	--	--	--
Janitorial equipment	--	--	X	X	X	X	--	--	--	--

<sup>a</sup> Shelterees were permitted to bring items they deemed necessary for survival.

Table 112

Items Shelterees Would Bring  
for Another Shelter Stay  
(ES VIII-X)

Item	ES VIII	ES IX	ES X
Food	X	X	X
Beverages	X	X	X
Bedding	-	X	X
Toilet articles	-	X	X
Change of clothes	-	X	X
Recreational items	-	X	X
Candy	X	-	-
Wet/dry towelettes	-	X	-

the OCD method of stocking water appears to be acceptable from a public health point of view.

2. Under heat stress or medical emergencies, the present water allotment of 3 qt./person/day would be inadequate.
3. In a nuclear emergency, when time is of greatest importance, water drums could be filled without use of bag liners, with no predictable adverse bacteriological effects.

#### B. Food

1. The Nabisco wheat-flour biscuit was the relative shelteree preference over the Nebraska wheat-corn-flour cracker and the bulgur wheat wafer.
2. Much of the sample of the Nebraska cracker was burned or broken.
3. The carbohydrate supplement was well received.
4. OCD supplies as presently stocked in public fallout shelters appear to be sufficient for healthy men, women, and children for a two-week survival period.

#### C. Sanitation Kit

1. The commode bag liner is susceptible to puncture by sharp-edged debris which shelterees tend to discard in the commode.
2. Several commode chemicals other than Weladyne-F53 have been found adequate in the removal of commode odor as a major shelteree complaint.
3. Sanitation kit items used excessively included drinking cups, toilet paper, sanitary pads, and the hand cleaner (when stocked).
4. A styrofoam water cup has proved more durable than the translucent plastic cup or the paper cup.
5. The plastic gloves have been found to be very useful for either food handling or commode handling.

#### D. Sleeping Facilities

Corrugated fiberboard serves as an uncomfortable but adequate sleeping surface.

**2. Shelteree Personal Possessions and Recommended Supplies**

1. Items brought by at least one-third of all shelterees in the large occupancy tests included blankets or quilts, books, candy, combs or brushes, chewing gum, pillows, and tooth-brushes.
2. Additional equipment or supplies suggested by shelterees for shelter stocks included sleeping facilities, better food, better toilet facilities, recreational equipment, and storage facilities.

Conclusions and Recommendations  
(Implications for Research in the National Shelter Program)

I. Chapter 4 - Shelteree Characteristics

A. Publicity and Recruitment

Conclusions

1. Successful methods of publicity and recruitment included news releases, talks to civic and school groups, help from previous shelterees, the use of newspaper advertisements, and a recruitment contest.
2. As studies successively draw from the available population, recruitment becomes increasingly difficult.

B. Selected Groups

Conclusion

A total of 1,729 persons, aged 9 months-73 years, have participated in the experimental studies to date, approximating the 1960 U. S. Census on variables of age, education, and socio-economic status.

Recommendations

1. To probe relevant problem areas, occupancy studies should also be conducted with specialized groups, e.g., the very young, the very old, the physically handicapped, medical cases, hospitalized groups, and those in mental institutions.
2. Occupancy studies should be conducted on larger populations, e.g., 1,000 to 3,000-person shelter groups.

C. Civil Defense Preparedness

Conclusion

Approximately half of the total shelteree population professed knowledge of the location of a community fallout shelter.

Recommendation

There is a need for more successful communication of local civil defense information to the general public.



## II. Chapter 5 - Shelter Facilities

### Recommendation

Various multi-floor, multi-room, above and below ground shelter configurations should be tested in other occupancy studies.

## III. Chapter 6 - Pre- and Post-Shelter Processing

### Conclusions

1. The extent of pre-shelter testing, particularly with regard to individual testing, became less as occupancy groups became larger. With larger groups an interest in leadership prediction developed.
2. The lengthy pre-processing phase had an adverse morale effect in the larger shelteree tests.

### Recommendation

Pre-shelter processing time should be reduced to enable shelterees to enter the shelter soon after arrival.

## IV. Chapter 7 - Trained Shelter Management

### Conclusion

The testing of a shelter handbook by CDR-trained management furnished the basis for the compilation of a handbook for use by untrained management.

## V. Chapter 8 - Untrained Shelter Management

### A. The Shelter Situation

#### Conclusion

There is a need for a stocked handbook to help shelter occupants establish shelter organization, in the possible absence of OCD-trained leadership.

## B. General Emergent Management Organization

### Conclusions

1. A temporary and permanent staff organization format proved functionable in several large group occupancy tests.
2. The brief pre-shelter orientation address, on the point of self-management with the aid of a stocked handbook, proved helpful in initiating shelter organization in the temporary phase.
3. Primary problems encountered in initial shelter organization included obtaining volunteers, implementing instructions, and intra-shelter communication.
4. The triumvirate shelter manager system facilitates the implementation of the temporary phase of shelter organization.
5. In multi-chambered shelter facilities the smaller rooms tend to become organized more quickly than the larger rooms.
6. The research prototype CDR Community Fallout Shelter handbook for Untrained Shelter Management has been tested and found feasible.
7. The concept of an alternate staff to relieve permanent staff management has been found to be of value.
8. To the greater extent the Handbook instructions are followed, the more successful is shelter management. Conversely, to the greater degree the Handbook instructions are ignored, the greater the number of management and organizational problems.

### Recommendations

1. The permanent staff organization proposed for the 300-person shelter configuration should be adopted.
2. A fuller pre-shelter orientation on the Handbook should be tested, for future consideration as material for mass media instruction.

## C. Shelter Habitation Problems

### Conclusion

Areas which have, and those which may, pose shelter habitation problems for both trained and untrained management include (1) management and organization, (2) chain of command,

(3) shelter rules, (4) disciplinary problems, (5) early defecations, (6) medical problems, (7) sanitation, (8) odors, (9) rations, (10) pets, (11) space, (12) temporary exits, (13) fire, (14) shelter temperature, (15) nurseries, (16) exercise, and (17) pre-existent personal problems.

#### VI. Chapter 9 - Shadow Staff Procedures

##### Conclusions

1. The shadow staff procedure in large-group studies has proved to be a valuable source of information on in-shelter organization and activity.
2. As a study progresses, the shadow staff becomes recognized. However, there is no indication that this knowledge by the shelteree staff adversely affects their performance.

##### Recommendation

The shadow staff procedure should be continued in future occupancy tests.

#### VII. Chapter 10 - Shelter Handbook for Untrained Management

##### Conclusions

1. Using the research prototype CDR Handbook, 300-person shelter populations with emergent untrained leadership functioned adequately.
2. The research prototype CDR Handbook, although designed for shelters without trained management, could also be used as a guide for trained shelter management.
3. The use of a triumvirate shelter manager system has been found to facilitate implementation of the temporary phase.
4. The use of volunteers, rather than selection by random appointment, is essential to the formation of an efficient temporary staff.
5. Any conclusions on the adequacy of the CDR Handbook for 500-person shelter populations must await experimental replication on groups of similar or larger size.

### Recommendations

1. The research prototype CDR Handbook is recommended for adoption for 50-to 300-person shelter configurations.
2. Further occupancy tests should be conducted with larger shelter configurations, e.g., 3,000 persons, as a basis for development of a handbook for such shelters.
3. A mass media informational program on management of shelters in the absence of trained leadership should be developed.
4. The research prototype CDR Handbook is recommended as a training guide for an abbreviated shelter manager course that could be implemented in the event of a sudden nuclear emergency.

## VIII. Chapter 11 - Medical Aspects of Shelter Confinement

### A. Medical Complaints

#### Conclusions

1. Predominant medical complaints included headaches, colds, sore throats, stomachaches, nausea, cuts and abrasions.
2. Female shelterees registered more medical complaints than did male shelterees.
3. Frequency of medical complaints decreased as occupancy continued.

### B. Medical Supplies

#### Conclusions

1. The OCD Medical Kit appeared adequate under the conditions tested.
2. Shelter medics suggested many additional medical supplies for use under emergency conditions.

#### Recommendations

1. Local civil defense authorities should be informed of the need for community-stocked items, such as supplementary medical kits and sanitation supplies.
2. Experimental findings on shelter health hazards should be added to the stocked medical kit instruction booklet.

### C. Sanitation

#### Conclusions

1. Sanitation problems occurred in all studies because of a lack of washing facilities, leakage from chemical commodes, unsanitary food and water dispensing procedures, and general shelter uncleanness.
2. Packaging the carbohydrate supplement in small quantities within the metal container would facilitate sanitary dispensing of this item.
3. Mops and brooms are important for general shelter cleanliness.

### D. Nutrition

#### Conclusion

The bulgur wafer, or cereal food with similar nutrient content, appears adequate for maintaining health for a two-week shelter stay.

## IX. Chapter 12 - Defections

#### Conclusions

1. Defections result from a complex interplay of variables, many of which are difficult to isolate and abstract from the overall study design. Among these variables are management efficiency, space provision, shelteree attitude, and environmental austerity.
2. Shelterees who defected were found to have brought fewer essential personal survival possessions than shelterees who completed study confinement.

## X. Chapter 13 - In-Shelter Activities

### A. Emergency Operating Center

#### Conclusion

Shelter occupancy tests provide the opportunity for checking out EOC-shelter communications.

#### Recommendation

Further testing of EOC-shelter scenarios should be conducted in occupancy studies.

## B. Training

### Conclusions

1. For large shelter populations, small group presentation is preferable to one centralized training lecture.
2. Short training periods, twenty-thirty minutes in duration, given twice daily, are more effective than larger and more frequent lecture periods.

### Recommendations

1. Future occupancy tests should evaluate effectiveness of the in-shelter training program content.
2. To assure better attention, comprehension, and discussion, lectures should be adapted to small groups within the shelter configuration.

## C. Sleep

### Conclusions

1. Shift-sleeping does not appear to be an effective sleeping arrangement for a one-room shelter.
2. Adequate aisle space is difficult to maintain during sleep periods.
3. Bedding diminishes the discomfort of sleeping on the floor, but introduces the problems of reduced space and supply storage.
4. Corrugated fiberboard pallets provide an uncomfortable but adequate sleeping surface, although blankets would be a valuable addition to shelter supplies.

### Recommendations

1. Shift-sleeping, not recommended for one-room shelters, may be feasible for multi-roomed facilities.
2. Bunks are unnecessary unless vertical utilization of space is desired.
3. Daytime sleeping and nighttime activity should be investigated as possible adaptations to variations in day and night temperatures.

#### D. Time Perception

##### Conclusions

1. In the two-week studies, time passed rapidly during the first few days of confinement, and more slowly during the latter part of occupancy.
2. Activity and noise levels of groups provided with knowledge of time of day correlated highly with those of groups deprived of such information.

#### E. Feeding

##### Conclusions

1. When only OCD stocks are available, a daily six-water distribution system and four-food distribution system have been effective in encouraging shelteree consumption of survival-type rations.
2. For large shelter populations, sectional feeding is the more efficient procedure, whereas in small shelters central point distribution can be followed.

#### F. Nursery

##### Conclusions

1. The nursery concept has been found effective for temporary relief of parental responsibilities, in promoting better adult attention to training lectures, and in providing instructions and recreation for children as a group.
2. Responsibility for children must be assumed by some adult at all times.

##### Recommendation

The nursery should be implemented in community shelters containing children.

#### G. Recreation and Exercise

##### Conclusions

1. Recreational programs have been found to be helpful to shelter morale.
2. In the two-week studies, behavioral activity declined from a relatively high level upon shelter entry to a low point midway in the studies.

3. In the two-week studies, approximately one-half of shelter time was spent in the lying position, one-third in the sitting position, and one-sixth in the standing position.
4. In the two-week studies no marked trends were noted in bodily positions and activity patterns, indicating a fairly consistent physiological state throughout confinement.

#### Recommendation

Some exercise in the shelter is recommended. The type of exercise should depend on the shelter environment and the needs of the people participating. When there is a danger of shelter temperature rising above acceptable levels, isometric exercises are recommended over other types. On the other hand, where temperatures are uncomfortably low, more vigorous exercises might be preferred.

#### H. Religious Activities

##### Conclusion

Non-denominational Sunday services have been well received by shelterees.

##### Recommendation

Non-denominational services are recommended as a help to shelter morale.

#### I. Daily Schedule

##### Conclusion

In-shelter training, recreation, exercise, and religious services can be successfully conducted by untrained persons using Handbook material.

##### Recommendation

The various capabilities presented by the shelter population should be utilized in daily activities, and each shelteree, within practical considerations, should be assigned shelter tasks.



## XI. Chapter 14 - Shelteree Reactions

### A. Shelteree Testing

#### Conclusions

1. With regard to physical fitness testing, no deleterious effects were observed in physical fitness, psychomotor performance, visual motor coordination, depth perception, or dynamic balance. Other than a weight loss, usually recovered within two weeks, shelterees emerged in good physical condition on completion of confinement.
2. With regard to personality testing, no attenuation of mental abilities, attention span, concentration, or mental efficiency was indicated in test results. Neither were there any adverse effects on personal and social adjustment scores as a result of shelter confinement.
3. Permanent shelter staff members scored consistently higher than the remaining shelter population on a predictive leadership scale.
4. In general, healthy men, women, and children can endure two weeks' isolated shelter confinement under conditions of severe austerity without suffering deleterious physiological or psychological effects.

### B. Shelteree Reactions

#### 1. Post elter Questionnaire

##### Conc. ons

- a. Primary discomforts cited by at least one-third of all shelter study participants were lack of bathing facilities, chemical toilets, lack of space, sleeping conditions, uncomfortable temperature, and odors.
- b. Shelterees participating in the longer confinement studies gave longer estimates of endurance for extended stay than those shelterees participating in studies of shorter duration. Estimates given by men exceeded those of women and children.
- c. Over all the studies, mean estimates of endurance for extended stay ranged from two to twenty-one days.
- d. When asked if they would have volunteered for an occupancy test had they known what it would be like, 83% of all responding shelterees answered in the affirmative, and 74% stated they would volunteer for another study.

### Recommendation

To facilitate adjustment in the event of a nuclear emergency, the public should be informed of the nature of fallout shelter confinement.

## 2. Shelter Diaries

### Conclusions

- a. Occupants of the two-week studies reached their lowest morale level at the midpoint of the occupancy period, i.e., at the end of the first week.
- b. When depression does occur, it is highest in the morning hours, and diminishes toward the end of the day.
- c. Diary data in many respects duplicated the information obtained by the Post-Shelter Questionnaire.

## XII. Chapter 15 - Environmental Variables

### A. Temperature and Ventilation

#### Conclusion

Mean daily effective temperatures and temperature-humidity-indices ranged from 66°F to 83°F, creating uncomfortable but tolerable shelter conditions.

#### Recommendations

1. Various methods of heating and cooling shelters should be tested with human occupants.
2. Occupancy tests should be conducted to evaluate the effects of wider temperature variations.

### B. Space

#### Conclusions

1. Eight square feet per person, exclusive of storage, although uncomfortable, would appear to be adequate for the 300-person community fallout shelter. This conclusion is restricted to optimal temperature and adequate ventilation conditions. For shelters of 500 persons or more, the OCD specified 10 square feet per person appears to be indicated to avoid entry organizational problems associated with reduced space allotment.

2. Effective space utilization is an important problem of shelter habitation.

C. Noise

Conclusion

It was found that in small shelters the shelterees have a greater tolerance for noise, but that in larger shelters this tolerance decreases.

Recommendation

Means of attenuating noise in shelters should be developed in future occupancy studies.

D. Lighting

Recommendation

Methods of lighting shelters by means other than commercial power sources should be investigated.

XIII. Chapter 16 - Shelter Supplies

A. Water

Conclusions

1. Although the quality of water and the amount of water available have been found to constitute shelteree complaint factors, the OCD method of stocking water appears to be acceptable from a public health point of view.
2. Under heat stress or medical emergencies, the present water allotment of 1 qt./person/day would be inadequate.
3. In a nuclear emergency, when time is of greatest importance, water drums could be filled without use of bag liners, with no predictable adverse bacteriological effects.

B. Food

Conclusions

1. The Nabisco wheat-flour biscuit was the relative shelteree preference over the Nebraska wheat-corn-flour cracker and the bulgur wheat wafer.
2. Much of the sample of the Nebraska cracker was burned or broken.

3. The carbohydrate supplement was well received.

4. OCD supplies as presently stocked in public fallout shelters appear to be sufficient for healthy men, women, and children for a two-week survival period.

#### C. Sanitation Kit

##### Conclusions

1. The commode bag liner is susceptible to puncture by sharp-edged debris which shelterees tend to discard in the commode.
2. Several commode chemicals other than Weladyne-F53 have been found adequate in the removal of commode odor as a major shelteree complaint.
3. Sanitation kit items used excessively included drinking cups, toilet paper, sanitary pads, and the hand cleaner (when stocked).
4. A styrofoam water cup has proved more durable than the translucent plastic cup or the paper cup.
5. The plastic gloves have been found to be very useful for either food handling or commode handling.

##### Recommendation

The continuing problem of the chemical commode bag liner leakage indicates the necessity of using metal water drums rather than cardboard drums.

#### D. Sleeping Facilities

##### Conclusion

Corrugated fiberboard serves as an uncomfortable but adequate sleeping surface.

#### E. Shelteree Personal Possessions and Recommended Supplies

##### Conclusions

1. Items brought by at least one-third of all shelterees in the large occupancy tests included blankets or quilts, books, candy, combs or brushes, chewing gum, pillows, and tooth-brushes.

2. Additional equipment or supplies suggested by shelterees for shelter stocks included sleeping facilities, better food, better toilet facilities, recreational equipment, and storage facilities.

Recommendation

Public educational programs should be developed to inform the general public of necessary emergency preparations, including personal supplies that are most useful in community shelters.

## Forecast

### I. Proposed Research Rationale - 1967

There are several factors involved in the national fallout shelter system: (1) number of facilities, (2) number of spaces in facility configuration, (3) location of facilities, *i.e.*, whether or not in nuclear target areas, and (4) accessibility to the population during night and day. The first two of these variables are presented in Figure 17, based on the 1964 OCD Annual Statistical Report. Several points should be noted. Though the largest percentage of facilities (73%) ranges in capacity from 50-499 occupants, these shelters include but 14% of the spaces, and while the largest percentage of spaces (86%) is found in facilities of 500-3,000+ occupants, these shelters are but 26% of total facilities. It should also be noted that the 3,000+ facilities, although only 5% of total shelters, include 57% of all spaces.

These statistics have two implications for the preparation of a shelter handbook. It would seem feasible to prepare a handbook for shelters ranging in capacity from 50-500 occupants (73% of all facilities) and also a handbook for shelters containing 3,000+ occupants, which account for 57% of the marked spaces. Of course, the ideal handbook would be one amenable to all shelter configurations.

### II. Research Proposal

It is proposed for 1967 to validate the Shelter Handbook on 750-person and 1,000-person shelter occupancy groups. Primary research variables follow.

#### A. Untrained Shelter Management

The concept of self-management by untrained shelter occupants has been the crucial research variable of previous studies and will be continued. The basic difference between ES XI (750-person study) and ES XII (1,000-person study) and previous tests will be size of shelter population. In terms of psychophysics, does the increase from a 500-person group (ES X) to 750-person, 1,000-person, and 3,000-person configurations consist of one or several JNDs (just noticeable differences)? Do the problems of management increase linearly or logarithmically? Does the psychometric structure of these larger groups differ substantially from that of previous groups? What new management problems will emerge? Empirical tests will give insight into these and other management variables.

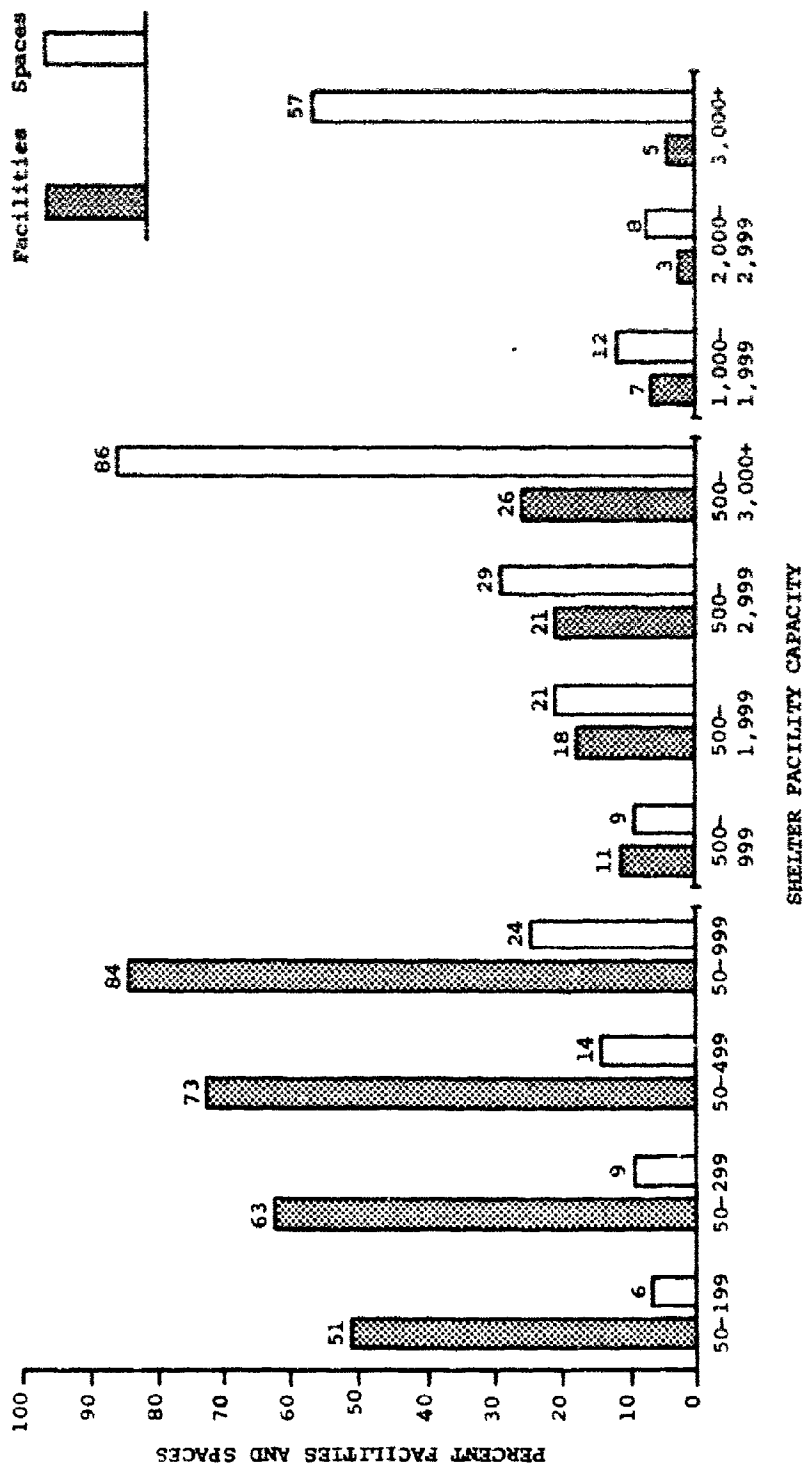


Figure 17. National Fallout Shelter Survey (1964 Annual Statistical Report).

## B. Shelter Handbook for Untrained Management

The rationale and assumptions underlying the CDR Handbook have been given elsewhere in this report. The implications of these assumptions should be considered with regard to both trained and untrained management. It is obvious that the ideal situation would be to have a trained shelter manager and shelter staff assigned to each shelter, to have them all reach the shelter in time of attack, and to have them all begin immediately and effectively to accomplish all the vital tasks. At this time, the number of trained and assigned shelter managers does not even approach this ideal situation. However, even if an adequate number of personnel were trained and assigned to shelters, not all of them would reach their shelters in time of attack, and many of those who reached their assigned shelters may arrive late. At a given time of day (or night) and time of year, many of these trained personnel could be out of town, ill, or caught in traffic, and thus not reach their shelters. Or, if some trained managers arrived late, they could find panic, confusion, or hysteria prevalent in their shelters.

One logical solution, as proposed, would be the development of a shelter handbook to be stocked in all shelters. Such a handbook could be used by either trained or untrained people for the efficient organization of a shelter. It would enable the first untrained adults entering a shelter to take command immediately and begin the vital tasks which should be completed during shelter entry. The handbook would be designed so that trained persons could assume command of any staff position at any time in an orderly transition. If no trained personnel arrived, untrained occupants would be able to carry out all the vital tasks during entry, then use information collected on registration forms to select the best qualified permanent shelter manager and staff. The permanent manager and staff, by following the handbook, could efficiently run the shelter for the duration of the shelter stay.

Whether or not the 300-person Shelter Handbook is applicable to a 500-person group (ES X) needs further research. In regard to 500-3,000-person groups, can the Handbook accommodate all large shelter configurations? Or are several versions necessary?

Are the temporary and permanent staff organizations tested in the 300- and 500-person groups appropriate for 500-3,000-person configurations? Are multiple concurrent temporary phases indicated for these larger groups? Does the permanent staff organization need expansion? If so, on which level should additional personnel be added, i.e., on the director level or section leader level? The proposed experimental tests should answer many such questions.



### C. Shelter Supplies

Variables of previous studies, to be continued on a lower priority basis, are evaluation of food and water supplies, sanitation kits, commode chemicals, and medical kits.

A variable of permanent interest will be that of personal supplies brought by occupants. In the past four studies (ES VII-X), shelterees have been permitted to bring personal items they considered necessary for survival. Such supplies, to be expected at the time shelters will be entered, are both assets and liabilities. Advantages include supplementation of OCD stocks and easing of discomfort factors, whereas disadvantages include creation of space problems and morale difficulties of those lacking such items. Which items should be brought and which should not? What personal supplies should be excluded from the shelter by management? How can management accomplish exclusion without causing resistance and rebellion? Should management appropriate individual supplies for the common welfare? If so, what procedure should be followed? Lastly, what items should be recommended as additional OCD stocks? What should be provided by local CD authorities? And what should the shelter occupant bring? An attempt will be made to resolve these questions for the larger-group studies of 1967.

### D. Emergency Shelter Management Training

As noted, the CDR Shelter Handbook has been formulated on the basic premise of the severest nuclear situation, one in which shelters will lack trained leadership. Obviously, however, properly trained shelter management is of greater value than emergent leadership. OCD has many courses of varying depth and duration in the present training program. However, in event of an imminent nuclear emergency, it would be advisable to have ready a practical short course, crash program type of shelter manager training, amenable to instant nationwide implementation. This program might conceivably be reduced to a several-hour indoctrination. Civil Defense Research at the University of Georgia has produced material for such a course, and will develop this as part of the 1967 proposal.

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